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Concrete
FEBRUARY, 1932

Further Knowledge About Concrete and Concreting Methods

Review of Year's Work Shows Definite Advances in Technical Knowledge About Making, Transporting and Placing Concrete—Construction Companies Utilize Improved Methods and Equipment

THE forward movement that is forever taking place in the development of new knowledge about concrete and its uses is well reflected in the varied activities conducted during 1931 by organizations, notably by the American Society for Testing Materials and the American Concrete Institute.

Activities of A. S. T. M.

The work of the American Society for Testing Materials is shown in part by the number of tentative standards affecting some phase of concrete making that were approved during and following the annual meeting of that organization in June. The tentative standards thus approved are listed, with full titles and serial designations, on page 26 of the September issue of CONCRETE. The list includes five specifications, on curing concrete in structures, on curing road slabs with bituminous coverings, with calcium chloride admixtures, with surface applications of calcium chloride, and with wet coverings. In addition, the list includes three tentative "methods," on the analysis of cement content of hardened concrete, on the determination of the apparent specific gravity of coarse aggregates, and tests for determining the structural strength of fine aggregate. As mentioned in another article in this issue, the A. S. T. M. has also adopted tentative standard specifications and tests covering hollow concrete masonry building units.

Work of American Concrete Institute

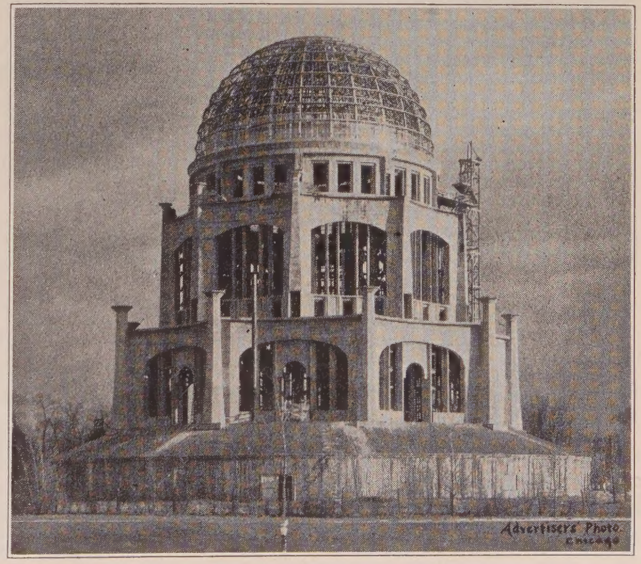
The American Concrete Institute has continued its work on a broad scale, committees of that organization being actively engaged in the solution of problems such as admixtures and workability, durability of concrete, color in concrete, investigation of the strength of reinforced concrete columns, analysis of design considerations in concrete buildings subjected to hurricane exposure, mixing and placing concrete in buildings, fabricating and placing reinforcing steel, specifications for ready-mixed concrete, studies of light-weight concrete, use of cement in bulk, and various other subjects of interest to the concrete construction industry.

A. S. T. M. Committee C-9

One committee of a technical society whose work is worthy of special mention is A. S. T. M. Committee C-9 on Concrete and Concrete Aggregates. This committee developed the five tentative specifications on curing, mentioned near the beginning of this review. In addition, the committee is conducting studies of designing and proportioning concrete, it is making further efforts to coordinate methods and specifications for curing concrete, and it is wrestling with other problems such as workability of concrete, the properties of aggregates, admixtures in concrete, permeability of concrete, conditions affecting the durability of concrete in structures, and specifications for ready-mixed concrete.

Control of Quality of Concrete

Among the contributions to our knowledge of the control of the quality of concrete, coming from sources other



Baha'i Temple, Wilmette, Ill., completed during 1931, is one of many reinforced concrete structures on which strict field control of the quality of concrete was maintained

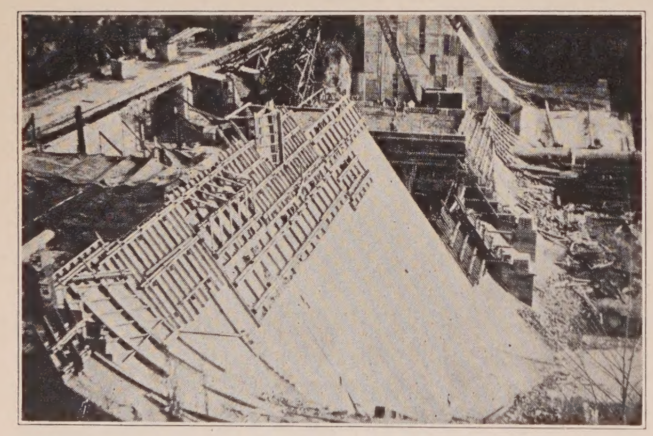
than technical societies, one of outstanding importance is a series of three articles by O. F. Dalstrom, in the February, March and April issues of CONCRETE. The most definite value of these articles, which describe in detail the methods employed by the bridge department of the Chicago & North Western Railway, lie in their explanation of the practical application of quality control.

Other contributions that deal in very practical ways with the control of the quality of concrete will be found in C. R. Harding's articles in the April and May issues of CONCRETE, describing the construction of the piers for the Southern Pacific Railway bridge across Suisun Bay; E. B. White's article in the June issue, describing the field control on a sand-haydite project; Archie A. Smith's contribution in the September issue, on determining the proportions for concrete from data pertaining to the aggregates; and two articles by Joseph A. Kitts, in the November and December issues, on the co-ordinated laws of concrete mixtures and their application.

Many technical societies, in addition to the A. S. T. M. and the A. C. I., have made valuable contributions to our knowledge of cement and concrete during the past year. Many of these contributions were either abstracted or briefly reviewed in CONCRETE.

Vibrated Concrete

The use of high-frequency vibrators in the placing of concrete work has had its most extensive development in massive construction work such as concrete dams and large piers; but vibration is now more widely applied to all classes of concrete construction. Especially valuable has this method been found in placing concrete in thin reinforced sections where ordinary puddling methods are impracticable or impossible, as in thin walls or partitions, in columns, and in similarly inaccessible locations. A notable new development in this direction is the use of high-frequency vibrators in coating pipe lines with thin, protective shells of reinforced concrete.[1] Experience has well demonstrated that high-frequency vibration produces concrete of far greater density than is possible with ordinary puddling methods. Interest in this subject is indicated by the appearance of several new vibrators during the past year. The American Society for Testing Materials, likewise, has taken action through a subcommittee of Committee C-9, this subcommittee having inaugurated a study of the use of vibrating tools for placing concrete.



The most modern methods available for controlling the quality of concrete are employed in the construction of Koon Dam, in Bedford County, Pa.

Ready-Mixed Concrete Gains Force

The growing interest in ready-mixed concrete is indicated by the large number of organizations which are paying special attention to this method of producing concrete. In addition to the activities of the National Ready-Mixed Concrete Association, organizations which have special committees at work on this problem include the American Road Builders' Association, the American Society for Testing Materials, and the American Concrete Institute. Representatives of each of these four organizations at a meeting held last summer, agreed on a division of the work of each society, with the view of avoiding duplication.

In the ready-mixed concrete industry itself the trend is quite clearly toward the installation of equipment that is automatic to a high degree, or easily controlled. One purpose back of this trend is the desire to reduce the plant personnel to a minimum. This desire, in turn, arises from the great fluctuations in demand—fluctuations which, as a rule, can not be anticipated. In consequence, a ready-mixed concrete plant that has a large plant personnel will have too many men on its hands with nothing to do during the off-peaks.

Tests of the influence of time on the properties of ready-mixed concrete transported in agitator bodies were conducted at Lehigh University and reported in the September (1931) issue of CONCRETE, pages 15 and 16. Similar tests were conducted at Columbus, Ohio. These tests indicated, as former tests have done, that ready-mixed concrete may be transported for periods of several hours in equipment of the types employed with actual improvement in the quality of the concrete.

An interesting survey of twenty ready-mixed concrete plants, prepared by E. F. McCready, showing plant and truck equipment and certain operating data, was published in the August issue of CONCRETE, pages 17 to 19.

Construction Methods and Equipment

Further improvement in construction methods and equipment is seen in the development of new equipment for handling cement in bulk, in more accurate proportioning devices, in the increased use of belt conveyors (both portable and stationary) for the distribution of concrete on large construction projects, and in the more careful attention to construction plant layouts.

Standardization of Admixtures

A definite attempt to arrive at a method of standardizing admixtures was launched in the early part of 1931, during the annual meeting of the American Concrete Institute.[2] This work is being pushed by a committee representing manufacturers of admixtures. At the committee's last meeting, on December 15, a proposed specification was presented, and was discussed in detail.

Improved Knowledge of Form Work

The past year has seen a distinct advance in the use of standardized forms for concrete work, in an apparent effort to avoid the waste of material and the uncertainties of form costs under the older methods of form erection and removal.

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[1] See March (1931) issue of CONCRETE, pages 23 and 24.

[2] See May (1931) issue of CONCRETE, pages 37 and 38.

Standardized forms of metal, of wood-fibre board, and of plywood, are being used on an increasing number of projects; and the same is true of form work specialties of the labor-saving types.

With the use of these standardized forms, this feature of concrete work is not only reduced in cost, but the cost is more definitely estimated in advance than under the old methods.

Regulations and Specifications

Among the regulations affecting the use of concrete which appeared during the year is the "Recommended Minimum Requirements for Fire Resistance in Buildings," issued by the U. S. Department of Commerce Building Code Committee. The parts of this publication that contain regulations affecting the use of concrete and concrete masonry units were abstracted in the June (1931) issue of CONCRETE, pages 23 and 24.

Work has progressed during the year on the proposed new report of the Joint Committee on Concrete and Reinforced Concrete. The untimely passing away of Prof. Willis A. Slater, chairman of the committee, was reported on page 30 of the November issue of CONCRETE.

No Hesitation in Development

In spite of the lower volume of construction work in 1931, as compared with previous years, there has been no let-up in the advancement of knowledge about concrete and its uses.

Lay Foundations for Wider Market for Concrete Products

Standards Adopted by A. S. T. M. and Federal Government Add to Confidence in Units—Wall Stability and Fire Tests Are Further Help—Some Solutions of Marketing Problems

THE year of 1931, though low in the use of concrete masonry units in building construction, has been a year of unusual advances in giving these materials "a place in the sun."

Federal and A. S. T. M. Specifications

Most recent among the advances just mentioned is the adoption of a standard purchase specification covering hollow concrete masonry units, by the Federal Specifications Board of the U. S. Bureau of Standards. This new specification, which carries the symbol SS-C-621, became effective October 15, 1931.

Another recent development was the adoption by the American Society for Testing Materials of tentative standard specifications and method of test covering hollow concrete masonry building units. The part of this tentative standard that deals with specifications for these units is published in this issue of CONCRETE.

Other Specifications Adopted

Other important specifications adopted or in preparation during the year include a purchase specification for cast stone, under preparation by the Federal Specifications Board of the U. S. Bureau of Standards.

A specification for the manufacture of concrete burial vaults was developed during the past year by a committee of the National Concrete Burial Vault Association, acting in co-operation with the American Concrete Institute.

A standard specification for terrazzo floor construction has been adopted under the title of "Specifications for Terrazzo Work," by the National Terrazzo and Mosaic Association. This standard is the result of several years of work by a committee that represented the main geographical sections of the United States and Canada. It co-ordinates the best features of several conflicting specifications that formerly were in use.

Wall Tests at University of Illinois

The load tests and wall stability tests of concrete masonry units conducted at the University of Illinois, working in co-operation with the Concrete Masonry Association, during the spring of 1931, will serve as a powerful influence in creating confidence in this building material.

The test walls included 51 panels of full story-height, each 9 ft. 4 in. high and 6 ft. wide, and 40 smaller panels, or wallettes, 4 ft. high and 2 ft. 8 in. wide. Several hundred tests were made on individual units. These wall tests were reported in full at the 1931 annual meeting of the American Society for Testing Materials, and an abstract of that report was published in the August (1931) issue of CONCRETE, pages 15 and 16.

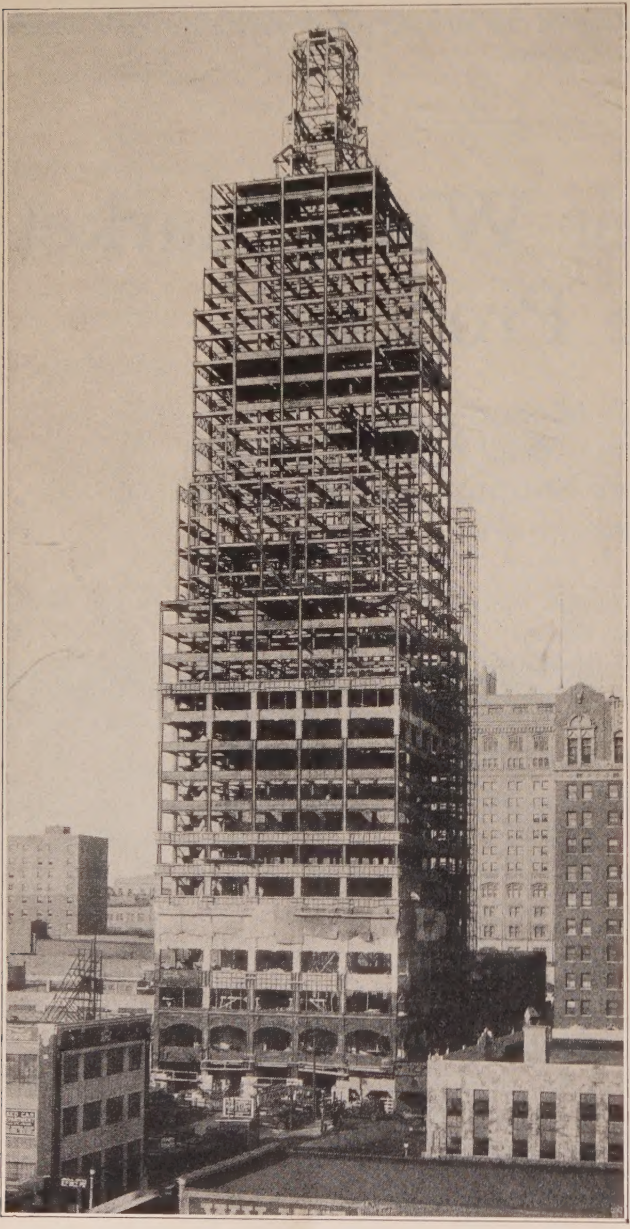
Fire Tests of Wall Panels

Further important tests, comprising a long series of fire tests of full size wall panels of concrete masonry units conducted at the research laboratory of the Portland Cement Association, were reported in detail at the last annual meeting of the American Society for Testing Materials. These tests were planned to bring out the influence of the grading and type of aggregate, the type of unit, cement content, type and amount of mortar, effect of plaster, curing of units, and seasoning of the wall.

Fire Resistance of Concrete Units

The new report issued by the U. S. Department of Commerce Building Code Committee, under the title of "Recommended Minimum Requirements for Fire Resistance in Buildings," contains various recommended regulations pertaining to the fire-resistive value of walls and partitions of concrete units.

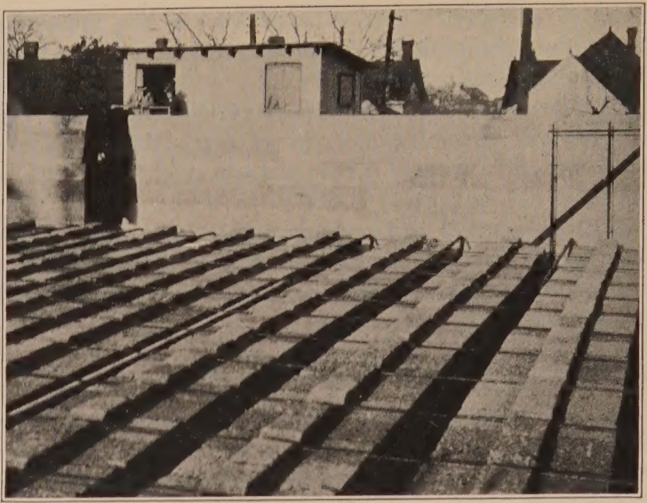
An abstract of this report, taken from the parts dealing with concrete and concrete masonry units, was printed in the June (1931) issue of CONCRETE, pages 23 and 24.



This 36-story office building of the Kansas City Power & Light Co., though having a concrete-incased steel frame, utilized 150,000 concrete filler tile in the floor construction

Light-Weight Units With Ordinary Aggregates

The logical material to use in the manufacture of light-weight concrete masonry units is a light-weight aggregate. In sections where light-weight aggregates are not commercially available, some progress has been made toward the development of light-weight units through the use of thin, specially designed webs and shells.[1]



New type of concrete filler tile used in floor construction is example of tendency toward wider markets for concrete building units

Manufacturing Processes

Improvements in manufacturing processes during the past year include wider use of high-frequency vibration, especially in the manufacture of cast stone, improved curing methods, increasing use of color, and better control of the quality of the concrete used.

Contributions to the literature on manufacturing processes include the American Concrete Institute's "Recommended Practice for the Manufacture of Concrete Building Block and Tile," published in the April (1931) *Journal* of that institute, and a series of articles on "Profitable Manufacture of Concrete Building Units," by Fred A. Sager, published throughout 1931 in CONCRETE.

Tests conducted during 1930 at Dayton, Ohio, to determine the value of high-pressure steam curing, demonstrated the value of this method,[2] although admittedly the process as there conducted would be somewhat expensive. Further work was accomplished during 1931, with the view of developing a more economical procedure.

To Broaden Scope of Market

The difficulties of the past few years have served, more than ever before, to emphasize the need for broadening the scope of the market for concrete masonry units. Much thought has been given to this subject.

In the field of cast stone, some manufacturers are of the opinion that the development of a distinctive product, emphasizing color and texture will lead the industry into a field of its own, where natural stone can not compete because of prohibitive cost.

With respect to concrete building units and other concrete products, many manufacturers express the view that diversification, coupled with consolidations of plants, will in time restore the industry to its former condition of prosperity.[3]

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[1] See March (1931) issue of CONCRETE, pages 21 and 22.

[2] See February (1931) issue of CONCRETE, page 43.

[3] See article by Austin Crabbs, in September (1931) issue of CONCRETE, as one illustration of this feeling.

Some Solutions of Marketing Problems

One plant management in Omaha[4] seems to have widened the scope of its market in an effective manner, not through diversification of products, but by developing the outside trade territory and selling through material dealers throughout that territory. Shipments are made for distances up to 150 miles.

In the May (1931) issue of CONCRETE another manufacturer tells of a successful sales campaign in Dallas, where the material was sold in competition with clay tile in a market where the clay product was well established.

The November issue of CONCRETE, pages 10 to 12, tells how a market for cast stone was built up in Madison, Wis., while the January (1932) issue, pages 13 and 14, describes a unique method of developing a market, in the same city, for back-up units. In this plan the plant management arranged for the purchase of units from a manufacturer in another city. The purpose of this arrangement was that of avoiding additional plant investment during the period of market development.

Some of New Uses in Prospect

The recognized need for developing new uses for concrete building units and other concrete products suggests a study of some of the new products which have appeared, but which are not as yet manufactured on an extensive scale.

One such product is a precast curb-and-gutter unit made by a patented process. Another is a concrete unit molded into the form of a multiple duct for the housing of underground wires.

Then there are the older special products, such as concrete septic tanks, which only a comparatively few concrete products manufacturers are making, and for which the potential market has scarcely been touched. Others in this category include units such as structural tile floor fillers, manhole block, fence posts, silo staves, chimney block, ash receptacles, and various other units. Some of these have at best only a limited market, while others have larger possibilities. Furthermore, the potential market for special products is quite different in different communities; but the development of such markets will aid directly in the broadening of the market for all products made of concrete.

Much has been accomplished in 1931 toward consolidating the position of concrete products. The foundations have been laid for widening the market. Well-directed enterprise will in due time take advantage of the new opportunities thus created.

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[4] See April (1931) issue of CONCRETE, pages 38 and 39.

Question of First Block and First Block Machine Raised

An eastern subscriber who has been in the concrete products business more than 20 years writes that he has never seen any information pertaining to the history of this industry.

He would like to have data on who made the first concrete block and who made the first concrete block-making machinery, and something about the early history and development of the industry. A casual reference to the subject will be found on page 19 of the April (1930) issue of CONCRETE, in a description of a concrete block plant in Minneapolis which has been in operation about 40 years. The early block-making equipment at that plant consisted of wooden mold boxes into which the hand-mixed concrete was shoveled by hand and tamped by hand. These mold boxes could not be classed as machinery in the modern sense of the term.

Readers who have information on the first concrete blocks and the first block-making machinery will confer a favor on the industry by writing to CONCRETE about it.

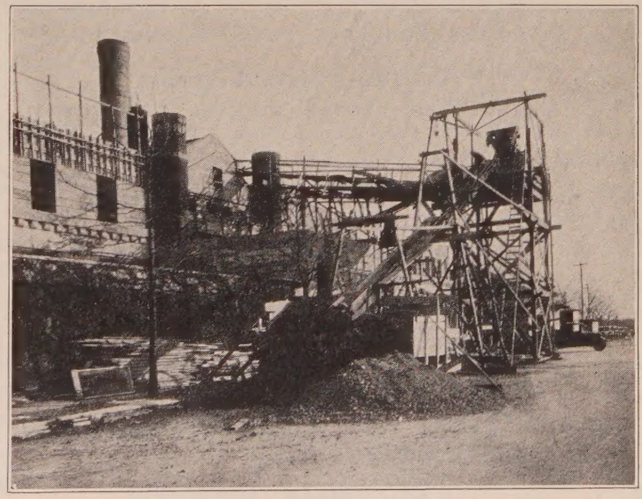
Elevate Aggregates Instead of Mix on Building Contract

The C. D. Cosgrove Company, of Glen Cove, N. Y., has recently completed a contract for building the Nassau County jail at Mineola, Long Island. In setting up for this job, their chief engineer, Ebenezer Howell, planned a novel concrete mixing and placing layout, with which he reports having had notable success.

Instances of the use of belt conveyors for placing wet concrete are becoming increasingly frequent. Mr. Howell reversed this general practice. The aggregates were conveyed by belt to a mixer located as close as possible to the placing point, capitalizing the economy of mechanical handling and the flexibility of placing the mix with concrete barrows.

Two portable belt conveyors were used, each 25 ft. long, 16 in. wide, of the troughing type, manufactured by the George Haiss Mfg. Co., of New York, for handling both the sand and gravel. The conveyors were driven by gasoline engines.

These belt conveyors raised the aggregate on an elevation of approximately 30 deg. to a mixer which was mounted three stories above the ground. The mixer was of 1 cu. yd. capacity, and the concrete was conveyed from the mixer to the forms adjoining by means of wheelbarrows.



Mixing and placing layout on New York job, using two portable belt conveyors for raising aggregates to mixer

Their experience has been that this method is much simpler and less expensive than any other way in which the concreting operations could have been handled. They further found that the concrete is not honeycombed, as sometimes happens when a wet mix is carried a great distance in wheelbarrows or buggies.

Program of the

American Concrete Institute

To be held at the Wardman Park Hotel, Washington, D. C., March 1 to 4

TUESDAY, MARCH 1

9 A. M. to 2 P. M.—Registration

2 P. M.—First Session

Report of Committee 502, ARTHUR R. LORD, Chairman. Consideration of a motion to submit Tentative Construction Specification for Concrete Work on Ordinary Buildings (502-31-T—See Vol. 26, pp. 1 and 580, and Vol. 27, pp. 99 and 1181) to letter ballot for adoption as a standard.

Report of Committee 503, WILLIAM F. ZABRISKIE, Chairman. Consideration of a motion to submit Tentative Specification for Supplying, Fabricating and Setting Reinforcing Steel on Ordinary Buildings (503-31-T)—See Vol. 26, pp. 444 and 910, and Vol. 27, p. 1186) to letter ballot for adoption as a standard.

Report of Committee 506, ARTHUR R. LORD, Chairman. Consideration of a motion to submit Tentative Construction Specification for Concrete Work on the Small Job (506-31-T—See Vol. 27, pp. 65, 525 and 1184) to letter ballot for adoption as a standard.

"Problems in the Design and Construction of Concrete in Major Irrigation Structures," by BYRAM W. STEELE, Civil Engineer, U. S. Bureau of Reclamation, Denver.

"Concreting Problems in the Chats Falls Power Development," by COL. H. L. TROTTER, Fitzroy Harbor, and WILFRED SCHNAAR, Hydro-Electric Power Commission of Ontario, Toronto.

8 P. M.—Second Session

"Special Finish Concrete Sidewalks in Washington, D. C." is the subject of a proposed paper for which arrangements are not yet complete.

"Cast Stone as a Means to Color in Architecture," by FRED R. LEAR, Department of Architecture, Syracuse University.

Pittsburgh Bridge Design and Construction with Motion Pictures.

"The Design of Concrete Arches in Allegheny County," by G. S. RICHARDSON, Assistant Engineer of Bridge Design, Bureau of Bridges, Department of Public Works, Allegheny County, Pennsylvania.

"The Construction of Concrete Arches in Allegheny County," by V. R. COVELL, Chief Engineer, Bureau of Bridges, Department of Public Works, Allegheny County, Pennsylvania.

WEDNESDAY, MARCH 2

9:30 A. M.—Third Session—Concrete Masonry

"The Structural Performance of Concrete Masonry Walls," by F. E. RICHART, Research Professor of Engineering Materials, University of Illinois.

"The Effect of Mortar Strength on the Strength of Concrete Masonry Walls," by R. E. COPELAND, Engineer, Cement Products Bureau, and A. G. TIMMS, Associate Engineer, Research Laboratory, Portland Cement Association.

"The Strength of Concrete Masonry Walls After Standard Fire Exposure," by C. A. MENZEL, Portland Cement Association.

"Properties and Problems of Masonry Cements," by J. C. PEARSON, Director of Research, Lehigh Portland Cement Co.

Afternoon

There will be no session of the American Concrete Institute in the afternoon; the period will be free for inspection trips, general sightseeing and committee meetings.

8 P. M.—Fourth Session

"The Design, Construction and Test of the Rogue River Bridge," by ALBIN L. GEMENY, Senior Structural Engineer, Bureau of Public Roads, and C. B. MCCULLOUGH, Bridge Engineer, Oregon State Highway Department.

Report of Committee 105, Reinforced Concrete Column Investigation, F. E. RICHART, Chairman.

"Deflections and Vibrations in High Structures," by L. J. MENSCH, Engineer and Contractor, Chicago.

THURSDAY, MARCH 3

Morning

The Bureau of Public Roads and the Bureau of Standards will be hosts to American Concrete Institute visitors, who will board busses at the hotel for the round trip.

2 P. M.—Fifth Session

Business of the Institute.
President's Address.
Induction of Officers.

"Studies of the Workability of Concrete," by T. C. POWERS, Portland Cement Association.

"New Studies of Light Weight Building Materials," by H. HERBERT HUGHES, Building Materials Section, Bureau of Mines.

"The Effect of Vibration on Concrete"—a progress report from Committee 106, R. F. LEFTWICH, Author-Chairman.

"Tests of Transit Mixing," by S. C. HOLLISTER, Professor of Structural Engineering, Purdue University.

8 P. M.—The 28th Annual Dinner

FRIDAY, MARCH 4

9:30 A. M.—Sixth Session

"The Mt. Vernon Memorial Highway."
Design—by R. E. TOMS, Principal Highway Engineer, Bureau of Public Roads.
Construction—by J. W. JOHNSTON, District Engineer, Bureau of Public Roads.

Proposed Specifications for Concrete Pavements for Municipalities—Report of Committee 902, Concrete Pavement Standards, F. C. LANG, Chairman.

"The Mortar Voids Method of Designing Concrete Mixtures," by MARK MORRIS, Iowa State Highway Department.

Afternoon

A tour of Arlington National Cemetery and Mt. Vernon by special busses leaving from the Wardman Park Hotel. The route will be over the new Mt. Vernon Memorial Highway, described at the morning session.

Fireproofing Steel-Framed Buildings With Cinder Concrete

Construction Superintendent Tells of Methods Employed in New York City—Usually Sublet to Fireproofing Contractor—What the Work Comprises

By J. ARTHUR GARROD
Superintendent of Construction, Boston, Mass.

In New York City the fireproofing of steel-framed floors has become highly specialized work, usually sublet to a fireproofing contractor.

A contractor in another large city, having considered the possibilities of specializing in this type of work in his own city, sent one of his construction superintendents to New York to get all the information he could gather, with special reference to methods and costs.

In this article, and in two others to follow, the construction superintendent gives readers of *Concrete* the information he collected. Not only contractors, but architects and structural engineers as well, will find valuable and usable data in this series.

This first article describes the nature of the work, the location and erection of the hoist, and the general methods and procedure employed.

The next installment will describe the erection of the form work, illustrated by a number of sketches. The final article will cover the placing of reinforcement, outlet boxes and conduits, the proportioning, mixing and placing of concrete, the stripping of forms, and the finishing of the surface.—The Editors.

THE writer had occasion to visit New York City for the purpose of observing the methods in use in the metropolis, for fireproofing the steel-framed floors of commercial buildings with cinder concrete.

I called upon a leading firm of general contractors to whom I was well known. I found that, in their opinion, fireproofing with concrete has become so specialized a part of the New York City building industry as to make it much more economical to sublet it to a specialist than to attempt to perform the work with the general contractor's own forces.

Cost of the Work

The price paid for such work was said to be 28 to 30 cents per sq. ft. This price takes care of fireproofing girders and beams and the forming of a 4-in. reinforced slab between beams.

I called upon a well-known quantity survey bureau. The head of this organization stated that the going price for this work averaged nearer 22 to 24 cents per sq. ft. than the higher price mentioned by my contractor friends. This bureau often surveys "concrete arches" from the architect's plans, but usually their surveys are made use of by the general contractor, for assuring the reasonableness of the subcontractor's bid, rather than by the subcontractor. The fireproofers prefer to submit figures upon their own surveys.

Buildings of Various Sizes Inspected

Armed with introductions from my friend, the general contractor, I made appointments with certain of the larger fireproofing contractors to inspect their work in progress. In other buildings I was accorded the privilege of viewin the work without a previous introduction.

On a large 36-story building on Madison Avenue, I had the opportunity to observe the fireproofing contractor's methods in all stages. On this building fireproofer's forms were being stripped on the 12th and 13th stories, concreting was in progress on the 18th and 19th stories, forms were being placed on the 19th floor, while on the 23rd floor, four floors above the form work, the riveting of structural steel was proceeding. All this was in progress during the month when the coldest weather is usually experienced.

On two other operations I had the benefit of personal explanations by an officer of the fireproofer's organization. These buildings were typical of hundreds of loft structures from Twentieth to Fiftieth Streets. One of these buildings was to house a printing establishment and was about 12 stories high. The other was a loft building of 17 stories, for rental.

The fourth and last building I had the opportunity to inspect was a vast structure bearing the name of a public utility company. It is in the downtown district, facing three streets, and will tower 69 stories above the sidewalk. It was being built by a contractor of international reputation, in a broad and well directed way. This design called for the fireproofing of extra large columns and deep girders found in the lower floors and in other locations where unusually large rooms occur.

As the methods employed on all the buildings described had a strong family resemblance I can generalize somewhat without conveying any wrong impression of the various and varying methods used in fireproofing, as I observed them.

When the structural steel frame has reached the third or fourth story the fireproofing contractor begins work.

He sets up a size S-14 or S-21 non-tilting type mixer in the basement. The mixer is usually so located and elevated as to discharge directly into the extra large wheelbarrows in which the concrete is conveyed to the floor forms. The cinders and the sand are delivered by trucks, through hatches in the sidewalk, to their respective piles in the cellar. The cement, in cotton duck sacks, is delivered by truck loads as required. Chutes are arranged to convey the sacks by gravity to the immediate neighborhood of the mixer, where a platform is provided and a waterproofed duck cover is utilized for protection.

Hoist Erected on Rental Basis

The platform hoist is provided and erected by a hoisting company, which specializes in renting such equipment. The hoisting speed is 200 ft. per min. The hoisting company erects additional guides and raises the head-beam every few days, as the progress of the building requires. This work must often be performed at night, as the hoist has continuous use. The hoist is always available for the fireproofing contractor's use from 7 o'clock each morning until the day's work is done in the evening.

Electricity, from the mains of the public service company, is the preferred power for both mixer and hoist, but gasoline engines were in successful use in one of the buildings. Exhaust gases were piped to the open air.

The fireproofer's hoist is located as near the "center of gravity" of concrete distribution as possible, and for this purpose a series of slabs are omitted, vertically over one another, and are not filled in until the fireproofing contractor's work is nearing completion. The cage supplied by the hoisting company is of the size required to accommodate two or three barrows at a time, as selected by the fireproofer. Power is metered to the fireproofing contractor and the hoisting engineman is on his payroll. The hoistway is protected on three sides with chicken wire, and it is guarded at each floor landing by a suitable hinged bar. The cab is covered with an overhead plank protection against falling objects. The openings left for the hoistway are filled in by the fireproofing contractor as soon after the completion of his work as the general progress on the building permits.

Wire Caging of Beams, Girders and Columns

The fireproofer's contract includes the wire caging to girders and beams, and to columns when they are to be concrete-covered. For applying this he employs a union lather at an enhanced rate of pay because of the hazardous nature of the job. The lather uses no staging, but crawls out on the steel. The caging is carried well ahead of the form builders, often two stories above them.

* * *

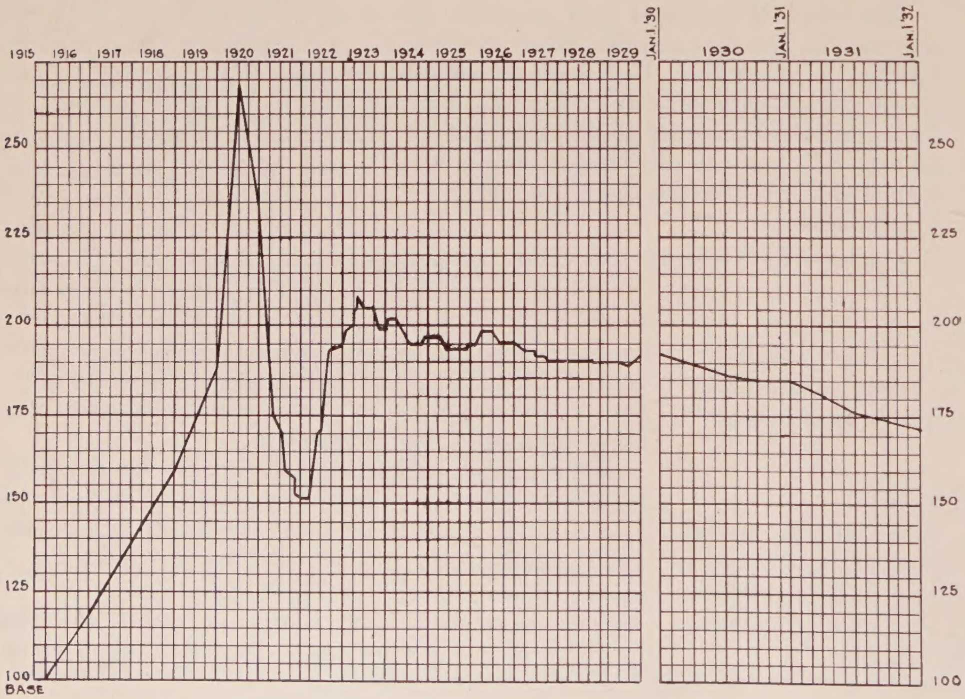
(The next installment will describe the erection of form work, illustrated by a number of sketches.)

Very Light Concrete Obtained with Pumice Rock Aggregate

A COMPANY has been organized in England, with works at Trafford Park, Manchester, which is to manufacture rheocrete, a pumice-rock building material and concrete aggregate. The undertaking, Rheocrete (Northern), Ltd., is a subsidiary of an old-established concern (F. McNeill & Co.), and though rheocrete has not hitherto been produced in the north of England, it has been extensively produced in London.

Pumice as a building material has only recently been introduced into the United Kingdom, but its possibilities in Germany have been recognized for many years.

Aberthaw Index of Cost of Building



The Aberthaw Index of Cost of Industrial Building for January 1 shows a further decline of two points since the previous quarter, and now stands at 172. This represents a cost of $1.81 per sq. ft. of floor area for a reinforced concrete industrial building of the type of the 7-story structure employed as the basis for the estimate.

This decline is the result of further small reductions in the prices of certain building materials, such as lumber, steel products and glass. While building wages have not generally been reduced, substantial reductions have been made in a number of individual cases.

Metal Base Experimental Road Fails Under Test

150-Foot Section in Sangamon County, Illinois, Removed and Replaced with Concrete Base—Details of Metal Base Construction

IN September, 1930, Sangamon County, Illinois, built a bituminous-filled brick pavement on a concrete base. The road which was paved is known as South Grand Avenue and is located about two miles east of Springfield. The standard pavement was omitted for 150 ft. and three 50-ft. sections of brick pavement were laid on metal base. This pavement carried normal highway traffic for nine months and then was subjected to an accelerated traffic test under which it failed.

The pavement on the entire project is laid on a comparatively flat grade. The subgrade is typical black clay loam that is very common in Illinois. The road is graded up above the surrounding fields and drainage conditions are excellent.

Brick pavement on a base of flat metal sheets. A concrete base pavement is in the background

Three Types of Metal Base

Three experimental sections were constructed, each 50 ft. long. In each section a different type of metal base was used. One section had a base of 10-gauge corrugated iron with corrugations running at right angles to the center line of the roadway. Sixteen-foot 8-in. L-sections were welded to these sheets along the outer edges to form a header curb which would retain the brick.

The second 50-ft. section had a similar base but the corrugations in the metal were run parallel to the center line. On this section the outer edges of the plate were turned up to retain the brick.

The third section was built with a base of ¼-in. flat metal sheets of blue annealed iron. These sheets were also turned up at the outer edges to form a header curb for the brick.

Details at Laps and Joints

Edges of sheets at transverse joints were either turned down to grip the subgrade, or placed to overlap such a turned-down edge. In the section with longitudinal corrugations sheets were lapped one corrugation and a T-bar was placed under each transverse joint. Where corrugations ran transversely the edge of the sheet along the center line rested on a T-bar. To bed the corrugated sections firmly the top inch of the subgrade was loosened by raking and then the sheets were bedded by tamping them into this loosened material.

State Conducts Accelerated Traffic Test

Though the road was constructed by the county, the Illinois state highway department observed construction procedure and kept maintenance and performance records of the experimental sections. Highway traffic over the section is comparatively light, so in June, 1931, the state highway department commenced an accelerated traffic test, running over the experimental sections a 4-wheeled, solid-tired Liberty truck carrying a gross load of 18 tons, with 8 tons on the rear axle. This is the maximum legal wheel load in Illinois.

Test Results in Complete Failure

Under this accelerated traffic the experimental sections became a complete failure. All three sections were deeply and permanently rutted. As the load passed, the entire surface could be seen to weave and roll under the test truck much like a worn-out macadam over bad clay soil. The individual bricks made a clicking noise under the truck and some breakage occurred.

The sections built with flat steel sheets and corrugations running transversely failed first and were in considerably worse condition than the other sections when the test ended.

Failure was particularly great along the outside edges. Along a considerable portion of the sections the outside courses of brick lifted up above the metal which served as a curb. Considerable transverse creep of the brick was thus allowed.

Standard Pavement Withstands Test

The test truck also ran over a portion of the standard pavement with concrete base, which joined the ends of the metal base sections, and there was no indication of distress on the standard pavement.

Following the completion of the accelerated test the experimental sections were removed and replaced by a standard brick pavement on a concrete base.

The Lesson Learned

Failure of the test section is an indication of the impossibility of supporting a block type surface on a flexible base. If a block type pavement is to remain rigid and smooth-riding enough to satisfy modern traffic it must be rigidly supported. The most economical type of rigid support seems to be a concrete base.

Suggested Section on Cast Stone for Inclusion in Building Codes

As an aid in promoting the use of high quality cast stone and in securing revision of building codes to cover cast stone, the Portland Cement Association and the Cast Stone Institute have collaborated in preparing a suggested section on cast stone for inclusion in building ordinances.

In any complete code revision it would be well to get cast stone mentioned in all sections referring to trim or facing materials as well as in a general section similar to the one published here. For instance, codes containing sections relative to veneering or facing should rate cast stone on an equal basis with natural stone, face brick and terra cotta, and should permit it to be used under the same conditions. The suggested code, which is intended as a means of controlling quality and promoting the wider acceptance of cast stone, follows:

"The term cast stone as used in this code shall be understood to mean a building stone manufactured from cement concrete, precast and used as trim or facing on or in buildings and other structures.

"Cast stone shall have an average minimum compressive strength at the age of twenty-eight (28) days, or when delivered on the job, of not less than five thousand (5,000) lb. per sq. in. and an average absorption of not more than seven (7) per cent of its dry weight.

"Samples from which test specimens will be cut shall be selected by the commissioner of buildings or his representative. In the event that specimens fail to meet requirements in the first test the test may be repeated on a second set of specimens. Tests shall be paid for by the manufacturer.

"Tests for compression and absorption for cast stone shall be made on three (3) two by two (2 by 2) in. cylinders or three (3) two (2) in. cubes cut from the stone as delivered on the job or from the regular stock in the yard. If not homogeneous throughout, specimens of cast stone to be tested for absorption and compression shall be taken in such a manner that they are composed of approximately one-half (½) of facing and one-half (½) of backing material and so that they can be tested in the position in which the cast stone will be laid in the masonry. Compressive strength and absorption tests on cast stone specimens shall be made in accordance with the American Concrete Institute tentative specifications for cast stone (P-3-A-29T).

"No individual specimen used in the above prescribed tests shall vary more than ten (10) per cent below in compression nor more than ten (10) per cent above in absorption from the average requirements specified above. All cast stone shall be branded with a permanent identification mark of the manufacturer, which shall be registered with the commissioner of buildings."

Meetings Hear Reports on Aggregate and Ready-Mixed Concrete Problems

Reports on problems entering into the manufacture of ready-mixed concrete were to be presented by several engineering leaders at the second annual convention of the National Ready Mixed Concrete Association at the William Penn Hotel, January 25 and 26.

Subjects of moment to ready-mixing plant operators and other concrete manufacturers were to be introduced at the sixteenth annual convention of the National Sand and Gravel Association, January 27 to 29, at the same place.

Following the address of President J. E. Burke of the Ready Mixed Association on January 25, Cloyd M. Chapman, New York City, was to present a paper on "Ready-Mixed Concrete from the Viewpoint of the Architect and the Engineer." Miles N. Clair, Boston, Mass., was to tell about "Control Tests of Ready-Mixed Concrete," and the important problem, "Purchase Specifications for Ready-Mixed Concrete," was to be discussed by R. B. Young, Toronto, Ontario.

The subject of "Standard Methods for Testing Concrete" was to be discussed by A. T. Goldbeck, Washington, D. C.

The annual banquet was scheduled to be held on the evening of January 25.

The second day of the convention was to be devoted to an open forum and to inspection trips. Such subjects as the following were to be discussed: Menace of the irresponsible operator, plant operations, haulage methods, servicing the job, relationships with material dealers, sales methods, and contacts with engineers and architects.

The January 28 morning session of the aggregate producers' association was to be devoted entirely to subjects of an engineering nature. F. H. Jackson was to present a paper on specifications for concrete based on designing the proportions to furnish a required strength. Stanton Walker was to present a discussion.

At the same session, H. E. Mattimore was to deliver an address entitled, "Some Comments on Aggregate Specifications," and P. J. Freeman, a paper on specification and production problems from the viewpoint of the engineer.

In a report on "Some Factors Entering Into the Use of Aggregates from Local Pits for State Highway Paving Construction," J. W. Kelly was to tell the results of a study made in Minnesota on this problem during the construction season of 1931.

Waterworks Conventions to Be Held at Memphis

The American Waterworks and the Waterworks Manufacturers' Associations will hold their 1932 national conventions at Memphis, Tenn., May 2 to 6.

Dedication and inspection of the $2,000,000 Sheahan pumping station, having a capacity of about 28,000,000 gal., will take place at that time.

Operating and Marketing Policies of Pioneer Ready-Mixed Plant

Finds Most Profit in Many Small Orders—Receiving and Handling Orders—Moderate Investment in Plant and Light Transit Mixing Equipment

By L. M. DEAN
Secretary, Central Concrete Co., Indianapolis, Ind.

THE ready-mixed concrete plant operated by the Central Concrete Co., at 2040 Montcalm St., Indianapolis, is one of the pioneer plants of this lusty young industry. When operations were started in January, 1925, there were probably not more than 25 similar plants within the boundaries of the United States.

While the plant was originally started as a central mixing type, it was gradually changed over to the central proportioning type of operation during 1927, 1928 and 1929, and is now operating wholly on the latter basis.

The location of the plant is a little more than two miles from the downtown section of the city.

Handling Materials

The aggregates, consisting of sand and gravel, are hauled by trucks from the stock-piles of a sand and gravel producer about two blocks from the plant. From the trucks the aggregates are dumped into a pit, and then elevated by bucket elevators to hoppers above the proportioning equipment.

Cement is handled in sacks, though we are now considering the installation of bins and equipment for handling cement in bulk. Our location on a spur from the railroad belt line that serves the industrial sections of the city places us in a position to realize the advantages of receiving cement shipments in bulk.

Proportioning by Weight

The gravel, the sand and the cement are all proportioned by weight, while the mixing water is measured.

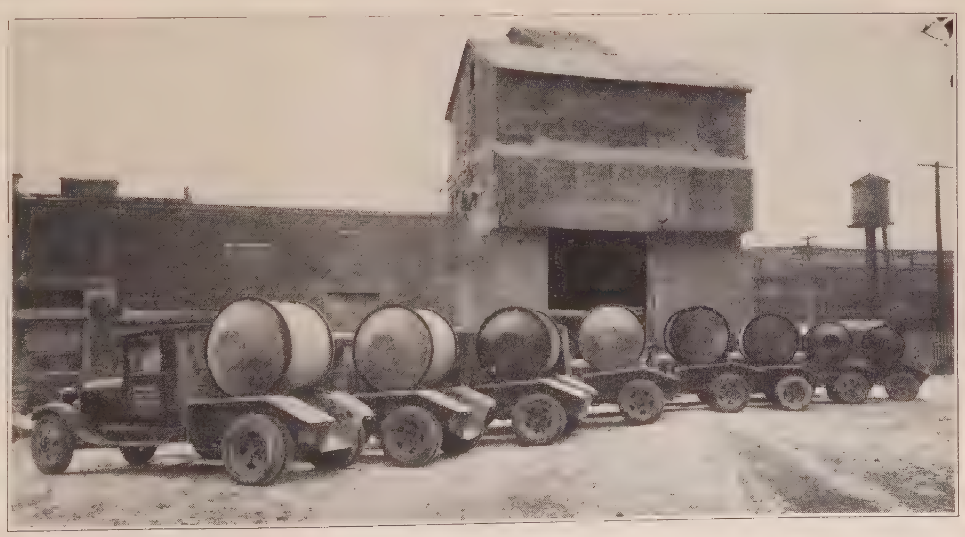
Through this control of proportions, and adherence to the water-cement ratio strength law, the quality of the concrete is controlled to meet the requirements specified. For illustration, the city's paving specifications call for concrete testing 3,500 lb. per sq. in. at the age of 28 days. On the other hand, much private work on structures is specified at 2,000 lb.

Number of Bags to Cubic Yard

The concrete which is supplied to the private trade, much of it in small quantities, is usually sold and referred to on orders as either 4-bag, 5-bag or 6-bag concrete. These designations, of course, are derived from the number of sacks of cement to the cubic yard of concrete.

The 4-bag, 5-bag and 6-bag mixtures correspond roughly to the old, but now discarded mixture designations of 1:3:6, 1:2½:5 and 1:2:4.

While no clear-cut distinction can be drawn as to the character of concrete work in which these three mixtures are used, it can be said in a general way that the 4-bag mixture is used in ordinary foundation work, the 5-bag mixture in more important foundations and mass concrete,



Central proportioning plant and fleet of transit mixers of the Central Concrete Co., Indianapolis, Ind.

and the 6-bag mixture in reinforced concrete. Variations naturally occur as between different specifications.

Salesmen Employed

Several salesmen are employed by the company during the main construction season. During the winter months one of the salesmen, who is an engineer well informed on the scientific proportioning of concrete, is put in charge of the plant.

Receiving and Handling Orders

Due to the fact that we cater to the small user of concrete, many calls are received by telephone. The office man who receives the call is expected to find out the grade of concrete wanted, at what hour it is wanted, and whether everything is in readiness to receive the concrete. All this information is entered on the order sheet, a duplicate of which is then handed to the yard man. From the information on the order he knows what proportions must be mixed, and he adjusts the proportioning scales accordingly. The yard man, in addition to having charge of the proportioning plant, also dispatches the transit mixing trucks in accordance with the delivery time shown on the order.

Orders turned in by salesmen are handled in much the same manner, a duplicate being handed to the yard man for his information regarding proportions and delivery.

Concrete Mixed in Transit

During the first two years of operation, through 1925 and 1926, the concrete produced at this plant was all centrally mixed and was delivered in dump trucks.

The plant management, in the meantime, was looking into the possibilities of other methods of producing ready-mixed concrete, and finally decided on the use of a light type of transit mixer which had just been developed by the Lee Transit Mixer Co., of Indianapolis. These truck bodies, which have a capacity of 1 cu. yd., can be mounted on the chassis of any of the lighter truck types. They are easily mounted or detached by mechanics.

The selection of the 1-yd. transit mixer was in part determined by the fact that much of the company's business was in the form of small orders, for miscellaneous uses and in miscellaneous locations. With this fact in mind, it seemed advisable to be equipped with transit mixers that were not too heavy to operate under the varying conditions encountered. In locations in deep excavations, floors above the ground, or other places that are not accessible to the truck and not easily reached with chutes, the mixer drum can be lifted off with a derrick and used as a bottom-dump bucket.

In 1927 the company bought two of the transit mixers just described, and in 1928 two additional ones were acquired. During these two years both transit mixed and centrally mixed concrete was supplied. In 1929 four additional transit mixers were bought, after which the mixer at the plant was removed and concrete was mixed in transit only. In consequence, since 1929, the company has operated a fleet of eight of these 1-yd. transit mixers, all of the same type.

Reference has just been made to the fact that much of our ready-mixed concrete business is in the form of small orders, for work such as foundations of small buildings, floors of private garages, private drives, sidewalks, park work, utility company repair work, and numerous other miscellaneous uses requiring any amount of concrete from 1 cu. yd. upward. Our experience has taught us that these small orders, taken collectively, are the most profitable. Most of them come to us unsolicited, either over the telephone or through personal calls.

Prices and Delivery Charges

Prices vary slightly from time to time, but the following figures represent the average prices during recent years, for delivery within one mile of the plant:

Mixture, bags of cement per cu. yd.	Approximate proportions	Price per cu. yd.
4 bags	1:3:6	$5.00
5 bags	1:2½:5	5.50
6 bags	1:2:4	6.00

A delivery charge of 25 cents per cu. yd. is made for each additional mile above one mile.

Moderate Capital Investment

We believe that with the type of plant and equipment owned by our company we have an economical establishment from the standpoint of capital investment; and this item of capital investment is one which prospective builders of new plants should investigate in the most thorough manner.

C. S. Meier is president of the Central Concrete Co. The writer is secretary of the company and is in charge of plant operations during seasons other than the winter season.

Research and Application to Selling on Masonry Association Program

Simultaneous With American Concrete Institute Sessions at Washington, D. C.

The program for the annual convention of the Concrete Masonry Association to be held at the Wardman Park Hotel, Washington, D. C., on March 1 and 2, has been practically completely arranged, and will present subjects of unusual interest and importance.

Papers as they are now scheduled include those on the subjects of designing the unit to fit the job, new developments in the industry, the value of research in selling, what A. S. T. M. specifications mean to the industry, where concrete products can be used in federal work, heavy-weight selling of light-weight units, and standardizing concrete masonry unit sizes. These are to be presented in the first day's sessions.

The morning of the second day will be occupied by a joint session with the American Concrete Institute, when a complete and comprehensive report will be given of all experimental work carried on during the past year, both by the products association and the agencies with which it is co-operating.

The subject of the afternoon—how the research program of 1931 can be put to work in 1932—will analyze the previous discussion to show in detail how each of the research problems that directly affect the industry may be used in making concrete masonry sales.

EDITORIAL

Capitalizing High Early Strength

ARCHITECTS, engineers and contractors, in increasingly large numbers, are learning the true significance of the qualities peculiar to high-early-strength portland cement.

Many had formed the habit of thinking of this cement as a special product, suitable mainly for special purposes where early hardening is an urgent necessity. Now they realize that the construction industry may profit in various ways from the early hardening of concrete.

For illustration, there is the advantage of greater speed. The long waits for the 7-day and the 28-day strength tests are eliminated when the ordinary 28-day strength is attained in 24 hours. The progress of the work is greatly speeded up.

The form work on concrete buildings is reduced in quantity and form labor costs are lower when forms can be removed the day after the concrete is placed.

On concrete paving work the cost of curing the new concrete is reduced because of the great reduction in the length of the curing period; and the same is true of the cost of maintaining detours. The inconvenience to the public and the loss to business are also reduced because the road or street under construction is closed for a shorter period.

In concreting operations during cold weather, the extra cost of heating the materials and the inclosure is lower, because the rapid hardening of the concrete shortens the heating period. The normal construction season may be extended from early spring to late fall, because contractors have less hesitation about placing concrete during moderately cold weather.

Recently several state highway engineers have told us that contractors are learning that the cost reductions due to the use of high-early-strength cement more than offset the additional cost of the cement. These contractors have learned how to capitalize the early hardening of concrete.

At a Price That Will Sell

IT is not improbable that the next few years will see some revival of single-family dwelling house construction, due in part to plans now being laid on a national scale for financing new buildings of this class.

The extent of the revival will depend in considerable part on how well the various building material interests succeed in bringing the cost of single-family dwellings within reach of the general run of home owners.

Again, the extent of the use of concrete in dwelling house construction will depend on how well the construction specialists can adapt that material to this particular purpose. How far can they get away from the house-building methods employed in Bible times, so that fireproof concrete houses, architecturally attractive, can be built on a mass production basis at a cost considerably lower than has been possible in the past?

In attempting this feat, builders must keep in mind the necessity for substantial cost reductions in plumbing, heating, electric wiring, plastering, painting, and related parts of the work. The cost of the actual concrete work in a concrete dwelling house is not likely to exceed one-fourth of the total; hence the necessity for attention to all the items that enter into the construction of the building.

These results can probably not be accomplished by the individual contractor who builds one or two or a dozen houses at a time. They can be accomplished by a strongly financed organization capable of building and selling at a price which home-buyers can afford to pay.

Don't Overlook the Pedestrian Subway

THE promotion of pedestrian subways is receiving entirely too little attention from the concrete construction industry of most cities. This is unfortunate, for here is one promotional activity which is a public benefaction.

People who crave statistics will be impressed with the fact that in 1931 some 15,000 pedestrians lost their lives in cities of the United States while attempting to cross streets at points of heavy traffic. Those who care less about actual figures can see for themselves that danger is ever present.

A few cities have recognized the need for giving the pedestrian a chance. Los Angeles has given special attention to the protection of school children, for that city has built nearly 100 underground passageways in the vicinity of schools. The construction of these subways has been accompanied by a most gratifying reduction in the number of motor vehicle accidents to school children.

The experience in Los Angeles has also demonstrated the readiness of children to use the underground passageways provided. School training and home training in safety have accomplished this end.

There are few directions in which contractors' organizations, chambers of commerce and other civic organizations can do as much for the cause of public safety in proportion to the expenditures involved, as through the promotion of pedestrian subways.

PROGRESS—In a Page

Current activities in research, in matters pertaining to concrete and cement, as being carried on or completed by various organized groups.

Proposed New Building Code Offered to New York City

THE proposed new building code for New York City, under preparation for several years, was formally presented to Mayor Walker on January 14 by John Lowry, chairman of the committee on building laws and regulations of the Merchants' Association of New York.

The proposed new code was prepared under the direction of the Merchants' Association, at the request of Mayor Walker, and with the active co-operation of technical societies, individual engineers and architects, and officials of the Bureau of Buildings of the borough of Manhattan.

Active work on the code was started early in 1929. A striking feature of the new document is its division into two parts, one of which comprises the code proper and is confined to general requirements, definitions, and related matter. The second part comprises the specific regulations covering the design of buildings (such as working stresses, wall thicknesses, and similar details) ; and this second part is presented in the form of rules of the Board of Standards and Appeals. The advantage of this arrangement is that, if the new code is adopted, future revisions of design regulations and related parts can be made by the Board of Standards and Appeals, without the necessity of having such changes acted upon by the Board of Aldermen.

In the design of reinforced concrete buildings the new code follows rather closely along the lines of the regulations issued by the American Concrete Institute. Concrete building units are given due recognition.

1931 Index to A. S. T. M. Standards

THE 1931 Index to A. S. T. M. Standards and Tentative Standards has been issued in pamphlet form. This index is designed to be of service in locating any specification or method of test in the bound Society publication in which it appears. The index is a very convenient reference in ascertaining whether or not the Society has issued any standards on a specific subject.

Copies are furnished without charge to those who send request to the American Society for Testing Materials, 1315 Spruce St., Philadelphia.

Courses in Ornamental Concrete at Utah Universities

COURSES in ornamental concrete work are being given at the University of Utah, at Brigham Young University, at the Utah Agricultural College, and at other educational centers in that state.

The course of instruction includes the making of plaques and molds; transferring designs to colored concrete surfaces; making ornamental tile; manipulation of colored concrete and mortar to represent travertine, terrazzo, pottery, granite and marble; designing, reinforcing and casting one-piece fireplaces; garden benches and table tops; placing random-colored walks and driveways, and related work.

The classes at the various places have been conducted by Almo B. Simmons, of Salt Lake City, Utah, in the form of special courses.

Railway Grade Crossings and Highway Intersections

RAILWAY Grade Crossings and Highway Intersections is the title of Bulletin No. 23, issued by the American Road Builders' Association.

The bulletin, which contains 48 pages, was prepared by two committees of the A. R. B. A. It includes recommendations on the elimination of grade crossings and other hazards on country highways, and the economics of the subject in metropolitan areas.

An important feature of the bulletin is the second part, comprising traffic studies, which includes information on highway capacity, parking, vehicle speed and street widths. This part also contains the results of a study of the traffic capacity of the Holland tunnel.

Copies of Bulletin No. 23 may be obtained from the American Road Builders' Association, National Press Building, Washington, D. C.

Central and Truck-Mixed Concrete Examined by Road Builders

AS PREVIOUSLY mentioned on page 26 of the September (1931) issue of CONCRETE, the use of central and truck-mixed concrete in highway work is being studied by the American Road Builders' Association, in co-operation with the National Ready Mixed Concrete Association.

The road builders' committee was organized in 1930 and made its first report at the 1931 convention of the A. R. B. A. This report consisted of a survey of the use of central and truck-mixed concrete in the paving industry and was instrumental in partially overcoming objections to its use. Particular attention is now being given to the development of equipment for transferring the premixed concrete from the hauling unit to the subgrade; water control and batch meters on truck mixers; and the standardization of such mixers.

Sodium Sulphate Soundness Test to Be Standardized

A. S. T. M. COMMITTEE C-9 on Concrete and Concrete Aggregates has undertaken the co-ordination of the various methods now being employed in testing the soundness of aggregates by the sodium sulphate method.

The committee believes that publication of its proposed co-ordinated method as a tentative standard will draw out competent criticism and result in final agreement on a standard method of procedure.

Wood-Fibre Board Forms Erected for Quantico Marine Barracks

Placing of 750,000 Sq. Ft. of Form Area Subjected to Rigid Inspection—Exposed-Aggregate Surface Treatment on Exterior—Unit Costs on Form Labor

This is the third of a series of articles, each complete in itself, describing the use of ¼-in. wood-fibre board as a structural material in concrete form work.

The next article will cover the use of this fibre board as form work for a monolithic concrete sewer in Kalamazoo, Mich., and that will be followed by details of the use of similar forming material on a concrete bridge contract at Evansville, Ind.—The Editors.

A FINE example of "form finished" concrete surfaces, both interior and exterior, may be found in the recently completed group of marine barracks buildings located on the U. S. Government reservation at Quantico, Virginia.

Rigid Inspection

It is doubtful whether any building, federal government or otherwise, ever received a more rigid inspection than was given those of this group. Concrete columns were allowed a tolerance of only ⅛ in. out of line. Concrete walls and slabs were held rigidly to close dimensions, and the concrete was tested for quality and strength.

Wood-fibre board was used structurally to form all exposed concrete surfaces. There was approximately 750,000 sq. ft. of exposed concrete surface area formed with this material. It included columns, beams, slabs, foundation walls, terraces, steps, tunnel and areaway walls.

All Fibre-Board Forms Completely Detailed

Each of the four barracks was typical in design. This is also true of each floor in the four barracks. This duplication of forming from one floor to another offered an exceptional opportunity for standardization and re-use of form work units.

The building, for the most part, was of the beam-and-girder type of reinforced concrete construction. Generally speaking, the beams were 4 ft. 10 in. c. to c., spanning 20 ft. between girders, providing a slab panel 4 by 20 ft.

Complete details were made of all forms. They were fabricated in the shop and given shop marks. They were put in place in much the same manner that structural steel is fabricated and erected. Forms were fabricated not only from details but were constructed as to the number of pieces of each forming unit, according to a predetermined progress schedule of general construction. In this way, labor and materials were held to a minimum.

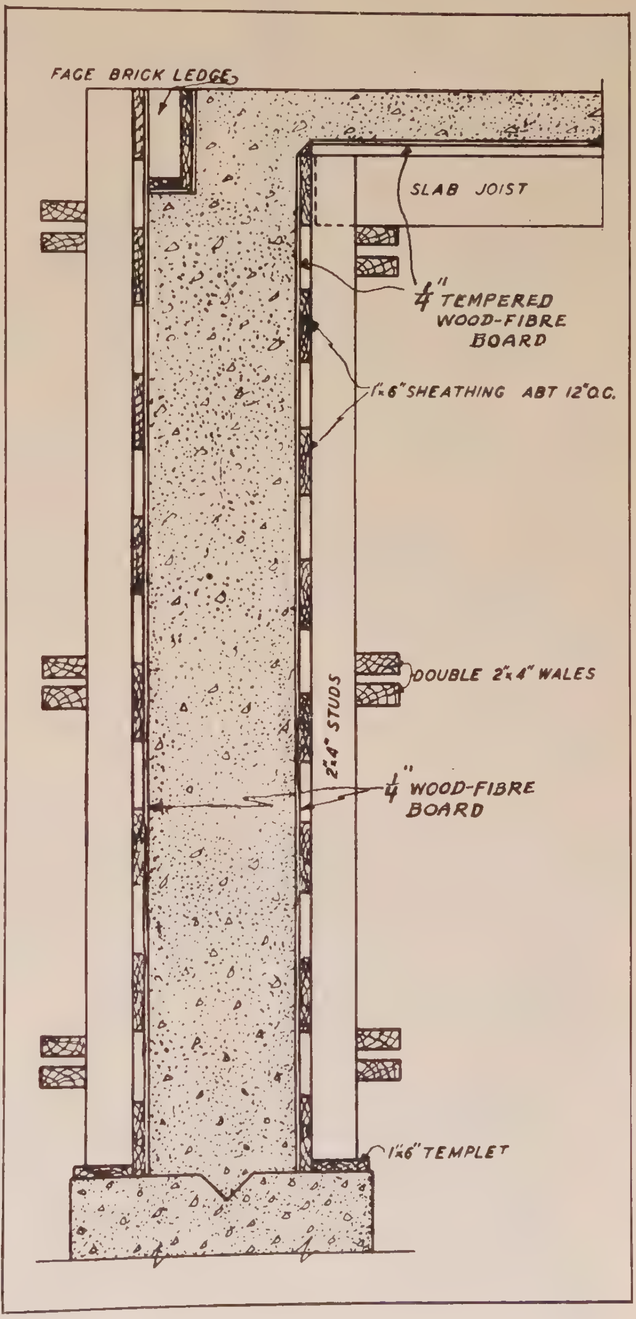


Figure 1. Cross section of foundation wall forms at Quantico marine barracks

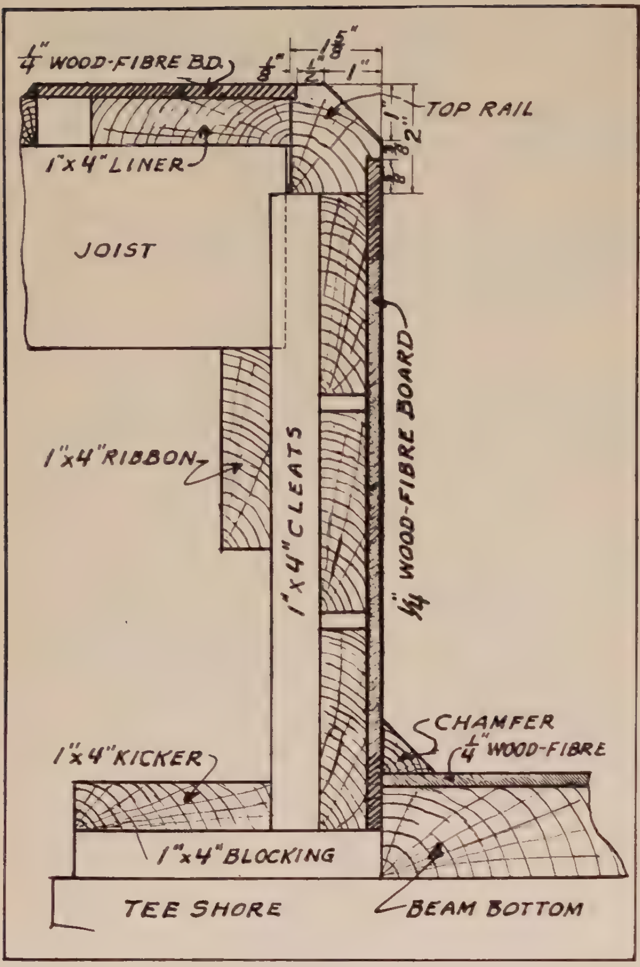


Figure 2. Detail of cross section through beam sides

Foundation wall forms were re-used in terraces, tunnels and areaway walls. Interior column, beam and slab forms were kept moving from one floor to another as rapidly as government engineers permitted form stripping.

Details of Form Construction

All wall forms were constructed as in Figure 1, with but slight modification. The 2 by 4-in. studs were spaced 30 in. on centers and placed with double 2 by 4-in. wales, top, bottom and center. This skeleton frame was then sheeted with 1/4-in. wood-fibre board.

Figure 2 shows a cross section of a beam side. This type of beam side may be seen in the left half of Figure 3, in the foreground. This type of construction avoided the use of specially cut lumber (2 by 2-in.) and permitted the use of cheap, third grade, 1 by 4-in. stock.

Observe the use of 1 by 4-in. blocking beneath the beam side, which permitted stripping of beam sides and slab bottoms without the necessity of stripping and reshoring beam bottoms.

Figure 3 shows a portion of the second floor of one of the barracks buildings, all framed and ready to receive the fibre board slab forms. The 1-by-4's were staggered throughout the job on slab and wall forms to save the labor of cutting. This method also provided a 100 per cent salvageable board, as there was neither wastage from cutting nor usage. The 1-by-4's never came into contact with concrete.

The 1 by 4-in. boards butting the beam sides were nailed to alternate joists, the full length of the slab, but the 1-by-4's in between were nailed only at each end.

This type of beam and slab construction permitted rapid and easy stripping.

Construction of Column Forms

Column forms were also constructed with 1/4-in. wood-fibre board and 1 by 4-in. backing. The make-up of the column forms was extremely simple. Fibre board was cut to proper column size dimensions. Two column sides of the same dimension for each column were cut 1 1/2 in. full to take care of the overlap of the two column sides cut to finished column dimensions. All beam and girder "cut-outs" were first made on the fibre board. After the

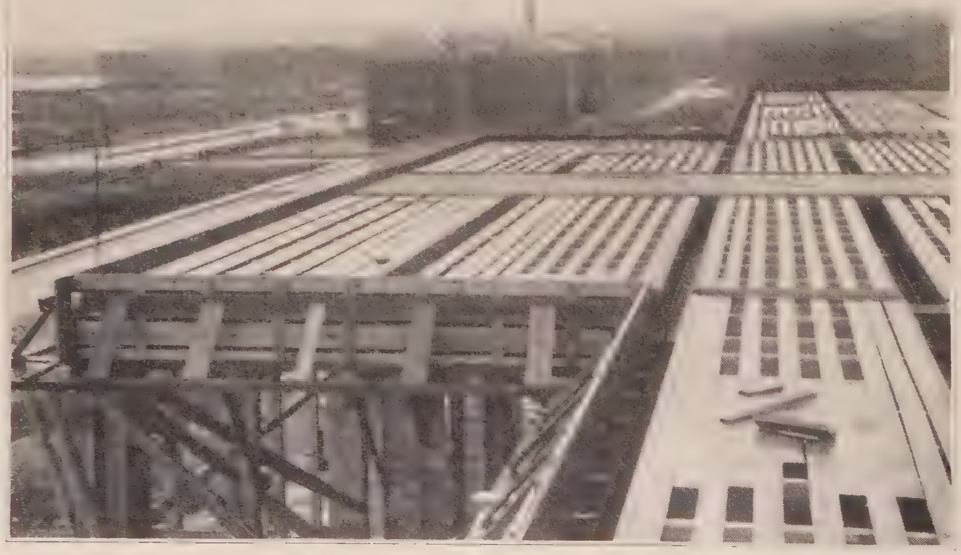


Figure 3. Floor form boards in place, ready for placing of wood-fibre board slab forms

fibre board was entirely laid out, a 1 by 4-in. strip was tacked full length of the column side, along each edge. The space in between was then filled in as closely as possible with 1 by 4-in. boards and nailed at random. All nails were clinched. This construction provided an extremely strong column form, light in weight and easy to erect.

Form Finished Concrete Surfaces

The "form finished" interior of the concrete frame has smooth surfaces and sharp, clean corners in columns and beams. These effects are the results of careful workmanship in forming and placing of concrete, together with the use of good forming materials.

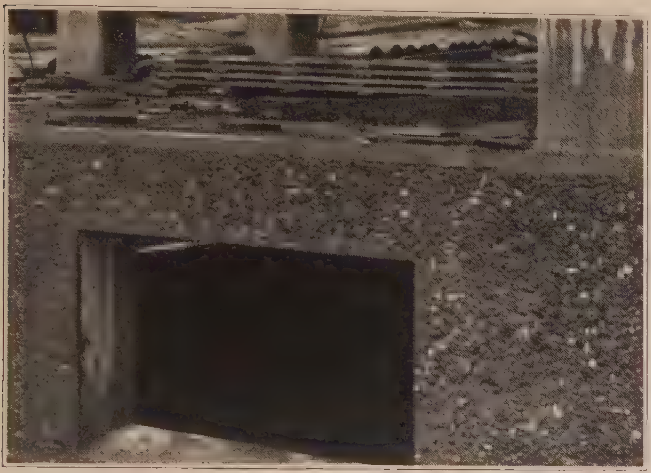


Figure 4. Example of exposed aggregate surface treatment

Exposed Aggregate Surfaces

All exterior surfaces of foundation walls above grade were specified to be "exposed aggregate" surfaces. Figure 4 is a sample of the finished walls after the forms had been removed and the surfaces wire brushed. The depth of the aggregate is uniform and the aggregate sizes have been well selected for uniformity of size.

A commercial preparation was applied to the forms to retard the setting of the cement at the surface. Due to the density of the wood-fibre board, a comparatively small amount of the chemical is needed to retard the setting of the surface concrete as compared to the amount needed for ordinary wood forms.

Form Labor Costs

Unpreventable delays in general construction schedules were instrumental in holding forming costs in both materials and labor to a high level. It is not unreasonable to suppose that if the original schedule had been maintained throughout the job, the labor costs of forming here recorded could have been reduced from 1 to 2 cents per sq. ft. of forming area, with the exception of the make-up costs. The following costs are an average, per sq. ft. of contact form area, for the entire area of 750,000 sq. ft.:

Make-up of forms	$.012
Erecting column forms	.075
Erecting beam forms	.075
Erecting slab forms	.050
Erecting foundation wall forms	.080
Erecting lower terrace wall forms	.080
Erecting upper terrace wall forms	.100
Erecting tunnel forms	.076
Stripping (all form areas) average	.010

Acknowledgments

The buildings of this group were designed by U. S. Government engineers in the bureau of yards and docks of the Navy Department, Washington, D. C. Ralph Sollitt & Sons, of Chicago, were the general contractors. The concrete form work was erected and removed by the Presdwood Concrete Forms Co., of Chicago, and the wood-fibre board used is the type known commercially as "tempered presdwood," manufactured by the Masonite Corporation, of the same city. A staff of technical inspectors was provided by the local marine corps at Quantico.

Pacific Coast Building Officials Now Located at Los Angeles

Headquarters of the Pacific Coast Building Officials' Conference, located at Long Beach, Calif., for the last five years, have been moved to the H. W. Hellman Building, 124 West 4th Street, Los Angeles, Calif.

Chas. A. Aikins has recently been made assistant to the secretary of the organization.

Wisconsin Products Meeting at Milwaukee

The annual convention of the Wisconsin Concrete Products Association was to be held at the Hotel Plankinton, Milwaukee, Wis., on January 28 and 29.

~ PERSONALS ~

Thomas H. MacDonald, chief of the U. S. Bureau of Public Roads for the last twelve years, has been presented the newly established George S. Bartlett Award.

The presentation was made at the opening session of the annual meeting of the American Road Builders' Association held at Detroit in January.

The George S. Bartlett fund executive committee late in December announced that its work had been completed in a report made to contributors to the fund. A bronze plaque instead of a medal was chosen as more acceptable, according to the announcement.

Henry R. Albion has been appointed as assistant manager of the eastern offices of the Portland Cement Association, with headquarters at Atlanta.

John R. Dwyer has been appointed on the staff of the American Society for Testing Materials, in which capacity he is to fill the position of technical assistant to A. S. T. M. Committee C-1 on Cement. His headquarters will be at the U. S. Bureau of Standards, Washington, D. C.

Mr. Dwyer was a member of Committee C-1 from 1920 to the time of this recent appointment. He entered the service of the Bureau of Standards in 1917, where, for some years, he was in charge of the testing and inspection of cement. In 1929 he was placed in charge of the cement reference laboratory.

Road Builders Discuss Many Phases of Design and Construction

Group Sessions Consider Technical Problems — Machinery Exhibit Diversified and Well Arranged—Bulk Cement, Ready-Mixed Concrete and Single-Lane Roads Draw Interest

THE twenty-ninth annual convention and exposition of the American Road Builders' Association, more popularly known as the "Road Show," was held in the Municipal Airport Building, Detroit, Mich., from January 11 to 15, inclusive.

The registration of about 16,000, though about 20 per cent short of several previous years, was considered a good showing, all circumstances considered. The machinery exhibit was well organized and the equipment displayed was of a diversified character.

Of Interest to Concrete Construction Industry

In the various sessions of the convention many reports, papers and discussions dealt with subjects of interest to the concrete contruction industry. Notable among these papers and reports were the following:

(1) "The Field of Use for Single-Track Concrete Roads," presented by E. M. Fleming, manager of the highways bureau of the Portland Cement Association.

(2) "Recent Practical Developments in Design and Construction of Concrete Highways." This paper comprises a committee report presented by the chairman, H. F. Clemmer, engineer of tests and materials, District of Columbia Engineer Department.

(3) "Recent Practical Developments in Design and Construction of Reinforced Concrete Pavements and Bases." This was presented as a committee report by the committee chairman, C. E. Foster, chief engineer of the Michigan State Highway Department.

(4) "Central and Truck-Mixed Concrete," consisting of a committee report presented by the committee chairman, Col. R. Keith Compton, director of public works, Richmond, Va.

(5) "Bins, Batchers and Equipment for Handling and Weighing Bulk Cement," presented as a joint report of the A. R. B. A. and the A. A. S. H. O., by the chairman of the joint committee, P. M. Tebbs, assistant chief engineer of the Pennsylvania Department of Highways.

(6) "Use of Bulk Cement," by Herbert Coffman, research engineer for the Hercules Cement Corp., Philadelphia, Pa.

(7) "Widening and Reconstructing Existing Highways," a committee report presented by the chairman, H. G. Sours, county engineer for Summit County, Akron, Ohio.

(8) "Recent Practical Developments in the Design and Construction of Low-Cost Bridges." This paper was prepared and presented by Searcy B. Slack, bridge engineer for the Georgia State Highway Board.

(9) Report on Subgrades, presented by Harry L. Shaner, commissioner of public works, Winston-Salem, N. C., chairman of the committee on design and construction.

(10) "Street Railway Track Pavements," a report of the committee on design and construction, presented by the chairman, Harry L. Shaner, commissioner of public works, Winston-Salem, N. C.

(11) "Resurfacing Existing Pavements," presented by Harry L. Shaner, commissioner of public works, Winston-Salem, N. C., chairman of the committee on design and construction.

(12) "Design and Construction of Concrete Pavement Bases," presented as a report of the committee on design and construction by the committee chairman, Harry L. Shaner, commissioner of public works, Winston-Salem, N. C.

(13) "Maintenance Methods and Materials," presented as a report of the committee on maintenance by the chairman, Major F. M. Davison, maintenance engineer, District of Columbia.

For the information of highway engineering departments, the majority of these papers and committee reports will be abstracted and published in CONCRETE.

Officers Elected

Officers for the coming year include T. H. Cutler, chief engineer, Missouri State Highway Department, who was elected president of the American Road Builders' Association; Robert B. Brooks, director of streets and sewers, St. Louis, Mo., who was elected president of the city officials division; and W. O. Washington, county engineer, Cameron County, Brownsville, Tex., elected president of the county highway officials division.

Seventy-Ninth Annual Meeting of Civil Engineers

The American Society of Civil Engineers held its seventy-ninth annual meeting in New York from January 20 to 23, during which a number of papers and discussions of interest to the concrete construction industry were presented.

Among the papers of this character was one on the New Jersey approaches to the George Washington bridge, another on the wind bracing of tall buildings, by C. R. Young; on "Building Foundations," by C. S. Proctor, as well as a report on "Bridge Foundations," by J. J. Yates.

At the business session of the society Herbert S. Crocker, consulting engineer of Denver, Colo., was elected president for the coming year.

Concrete Foundations Treated as Engineering Problem

Types of Foundations and Their Relation to Soil Discussed in First of Series on Inspection, Testing and Supervision of Concrete Work

By RICHARD H. VOSE
Civil Engineer, Robert W. Hunt Company, Chicago, Ill.

This is the first of a series of seven articles dealing with the inspection, testing and field supervision of concrete work.

While this and the next installment, which will cover the subjects of spread footings, mat foundations and deep footings, are of an introductory nature, readers who are familiar with inspection will realize the necessity for these preliminary discussions. The principles involved in the consideration of foundation materials and footing types must be understood if the intelligent treatment of these problems is to be expected.

Later articles will treat the subjects of concrete, testing of cement, inspection and testing of reinforcing steel, inspection and testing of aggregates, testing of concrete cylinders, and field supervision of concrete work.—The Editors.

ALL structures may be divided into two parts, the superstructure and the substructure, or foundation. It is the purpose of the foundation to support the superstructure by distributing the load to the earth beneath.

The success of every structure depends on properly designing the substructure upon which it rests. Because the foundation acts as a sort of middleman between loads imposed by the superstructure and the supporting soil, the perfect foundation will be the one that strikes an even balance between these two factors.

Types of Foundations

Briefly stated, there are two general types of foundation —those built on dry land and those built under the surface of a body of water or below the natural water table in porous land. The type of foundation used will vary, of course, with conditions. The simplest form is merely a widening of the base of a wall or pier so as to distribute the load over a sufficient area. Then there are spread footings, pile foundations, open well foundations and caissons, both open and under pneumatic pressure. The type of foundation is an individual problem dependent on the superstructure and the soil conditions.

Little Progress Made

Man has always had foundation problems. In early times, as today, he has had to be guided by the condition of the site and the materials at hand.

When we compare the foundations used by our ancestors with those of today we are amazed at the apparently little progress made, as far as basic principles are concerned, since early times.

The lowering of the water level in certain Swiss lakes has revealed piles upon which prehistoric man built his dwellings. Sheet piling, cribbing and cofferdams were in general use hundreds of years ago. Inverted arches and masonry offsets still stand, after centuries, to testify to the skill of their engineers. It is evident, therefore, that many fundamental principles were widely known and accepted long before the twentieth century. Of all the sciences, foundation engineering has, perhaps, shown the least rapid progress.

Concrete and Steel Bring Progress

Some progress has been made in recent times, however, and this is largely attributable to the advent of two new engineering materials. Steel, the first, made possible the increased height of buildings with the subsequent imposing of higher unit loads on the foundations. To meet this newly created problem of carrying high unit loads successfully, concrete, the second material, permitting a wide range of design, was used. The resulting improvement was the further development of footings from that necessary to support a single column to a composite footing or mat covering the entire area of the building. Another step forward was the advance in deep foundation methods. With high buildings came an increased demand for space for machinery, storage and other purposes; hence more basements. More basements meant providing continuous exterior walls which served as foundations for exterior columns and as a retaining wall against soil or soil-and-water pressure.

Modern invention has added improvements to our means of building foundations. Pneumatic work has improved, methods of excavating deep wells in clay have been bettered and concrete piles are taking the place of timber piling.

There is every reason to believe that so far as the relation of foundations to the superstructure is concerned progress will be sufficient to keep pace with other construction methods.

Relation of Foundation to Soil

When we consider the foundation's relation to the soil, however, we are faced with difficulties which today are the knottiest in the construction field. Rule of thumb methods still prevail to a great extent in spite of the fact that there are now available considerable data on which the engineer may base his calculations.

The only reason more is not known is because reliable information is lacking regarding previous construction and because of inadequate description of the soils and interpretation of the observed facts.

The importance of carefully studying the foundation in relation to soil conditions is made evident every year by the building failures that take place.

For example, a problem that faces the foundation engineer who decides to use footings is the differential settlements between the individual footings. It is necessary to compute the maximum probable settlement variation between the individual footings and to relate this data to the amount of unequal settlement the building can stand. There are two types of soil settlement—lateral movement and direct consolidation of soil particles. In making the computations consideration must be taken of the character of the soil to determine the type and amount of settlement that will take place. Here is one place where the investigation of the physical factors that determine soil relations has made prediction possible.

Pile Foundations a Difficult Problem

Should the engineer decide to use piling, he will find one difficulty in the lack of a reliable formula to compute the bearing load a pile will sustain. It has been shown that the pile gains its bearing power through skin friction and the resistance of the point. Then, too, the speed with which the pile is driven must be taken into account as well as soil conditions, as, for example, some soils are consolidated by the piles driven into them, while others are loosened. It is clear, then, that any formula which does not take these factors into consideration must be fallacious and dangerous to use.

As an alternative to the use of formulas to determine the bearing value of piling, it is customary to drive a few piles, then to load them to determine their bearing power. This method has little value, first, because in the case of a single pile the load is distributed over a large area with a consequent reduction in the specific pressure. Second, the relation between the width of the load and the depth of the pile is not taken into account. When the pile is longer than the width of the loaded area the results are beneficial due to the reduction of the intensity of maximum pressure acting on the ground and the shifting of the stress from the surface to the level where their lower ends are located. If the width of the load exceeds the length of the pile the pressure-reducing effect of the pile is very small.

Fault, in general, has been found with foundation planning in connection with what some believe to be the too free use of piling. Too often, it is asserted, the superstructure is designed to carry present loads, often with provision being made for future loading, while piling, on the other hand, are trusted to their full carrying capacity. As a result of the practice grave failures have resulted.

It is thus seen that much care should be taken in deciding on the type of foundation to be used in relation to a given soil condition. Questions of settlement, types of foundations, bearing capacity of loads and kindred problems are being investigated by research engineers and testing laboratories.

Effect of Freezing on Foundations

Another line of study which is now being carried out, and which should enter the foundation engineer's calculations, is the effect of freezing on foundations. The conclusions reached, so far, to explain the lifting action of the freezing, are that this phenomenon depends largely on four factors: (1) The compressibility of the unfrozen foundation soil, (2) the compressive strength of the frozen soil, (3) the depth of the freezing, and (4) the total adhesion between the pier and the frozen ground. The subject has not been exhausted and new factors may be added in the future.

Compressibility, Permeability and Cohesion of Soils

Our knowledge of the compressibility, permeability and cohesion of soils is reasonably complete and accurate. The permeability and compressibility of a soil determine its type, while the cohesion (or in the case of sandy, non-cohesive soil, the density) determines the state in which the soil is found. The chief difficulties encountered in making investigations along these lines are (1) the difficulty in getting samples of soil in the undisturbed state, and (2) the many variations existent among soils. However, soils having equal compressibility and permeability when found in the same conditions will react in an identical manner. It is this fact that gives the engineer a basis on which to work.

In conclusion it may be said that progress in foundation engineering is developing slowly from the rule of thumb stage to a scientific basis. As research develops and co-ordinates new facts it will become ever more possible to design a foundation which is not only safe in all respects but economical as well.

Coming Conventions

February 1-2—American Concrete Pipe Association, twenty-fifth annual convention. Edgewater Beach Hotel, Chicago, Ill.

March 1-2—Concrete Masonry Association, annual meeting. Wardman Park Hotel, Washington, D. C.

March 1-4 — American Concrete Institute, twenty-eighth annual convention. Wardman Park Hotel, Washington, D. C.

May 2-6—American Waterworks Association and Waterworks Manufacturers' Association, annual meeting. Memphis, Tenn.

Pressures on Circular Bearing Areas

Chart Gives Ratio of Maximum Bearing Pressure to Uniform Pressure, and Ratio of Effective Bearing Depth to Diameter

By **H. T. HEALD**[1] and **E. C. GRAFTON**[2]

THE following analysis shows a method of obtaining the maximum unit pressure under circular bearing areas for any position of the resultant load. It is assumed that the material in bearing is perfectly elastic and that it is incapable of taking any tension.

When the resultant load falls inside the kern of the section, the center one-quarter for a circle, the maximum intensity of pressure may be readily found by the usual relations for bending and direct stress. When the resultant load falls outside the kern a portion of the circle carries no stress and only a circular segment is in action. This condition requires a method of analysis based upon the properties of the circular segment.

Method and Formulas

Using the notation shown in the sketch, let x be the distance from axis X-X to any elemental bearing area dA. Then equating the total load to the total bearing pressure—

$$P = \int \frac{f}{k} x \, dA = \frac{f}{k} \cdot M_{x-x} \qquad (1)$$

where M_{x-x} is the static moment of the bearing area about the axis X–X.

TABLE 1

Properties of Circular Segments About C–C Axis

d = 1.00—Slide Rule Calculations

k	a	$\sqrt{r^2 - a^2}$	$\sin^{-1} \frac{a}{r}$	$(r^2 - a^2)^{\frac{3}{2}}$	A	M_{c-c}	I_{c-c}	x
.00	.500	.0	1.571	.0	.0	.0	.0	----
.10	.400	.300	.926	.0270	.0412	.0180	.0080	.4370
.20	.300	.400	.645	.0640	.1115	.0426	.01657	.3820
.30	.200	.458	.412	.0962	.1981	.0642	.0220	.3240
.40	.100	.490	.202	.1176	.2932	.0784	.02421	.2676
.50	.00	.458	.0	.1250	.3927	.0834	.02455	.2120
.60	.100	.490	.202	.1176	.4922	.0784	.02489	.1594
.70	.200	.458	.412	.0962	.5873	.0642	.02710	.1094
.80	.300	.400	.645	.0640	.6739	.0426	.03253	.0634
.90	.400	.300	.926	.0640	.7448	.0180	.04110	.0242
1.00	.500	.0	1.571	.0270	.7854	.0	.04910	.0

TABLE 2

Properties of Bearing Areas About X–X Axis

d = 1.00—Slide Rule Calculations

k	a	A	x	M_{c-c}	I_{c-c}	$A.a$	$A.a^2$	$2A.a.x$	M_{x-x}	I_{x-x}	$\frac{f\,max.}{f\,unif.} = \frac{K}{1.272\,M_{x-x}}$	$e_1 = \frac{I_{x-x}}{M_{x-x}}$	e
.00	.50	.0	----	.0	.0	.0	.0	.0	.0	.0	∞	----	.50
.10	.40	.0412	.4730	.0180	.00800	.0165	.00689	.01440	.0015	.00019	52.4	.060	.46
.20	.30	.1115	.3820	.0426	.01657	.0335	.01004	.02560	.0091	.00107	17.25	.111	.411
.30	.20	.1981	.3240	.0642	.02200	.0397	.00793	.02570	.0245	.00403	9.62	.173	.373
.40	.10	.2932	.2676	.0784	.02421	.0293	.00293	.01568	.0491	.01146	6.40	.234	.334
.50	.00	.3927	.2120	.0834	.02455	.0	.0	.0	.0834	.02455	4.72	.294	.294
.60	.10	.4922	.1594	.0784	.02489	.0492	.00492	.01568	.1276	.04549	3.69	.356	.256
.70	.20	.5873	.1094	.0642	.02710	.1173	.02350	.02570	.1815	.07630	3.03	.420	.220
.80	.30	.6739	.0634	.0426	.03253	.2020	.06060	.02560	.2446	.11873	2.57	.485	.185
.90	.40	.7442	.0242	.0180	.04110	.2975	.11900	.01440	.3155	.17450	2.24	.554	.154
1.00	.50	.7854	.0	.0	.0491	.3927	.19650	.0	.3927	.24560	2.00	.625	.125

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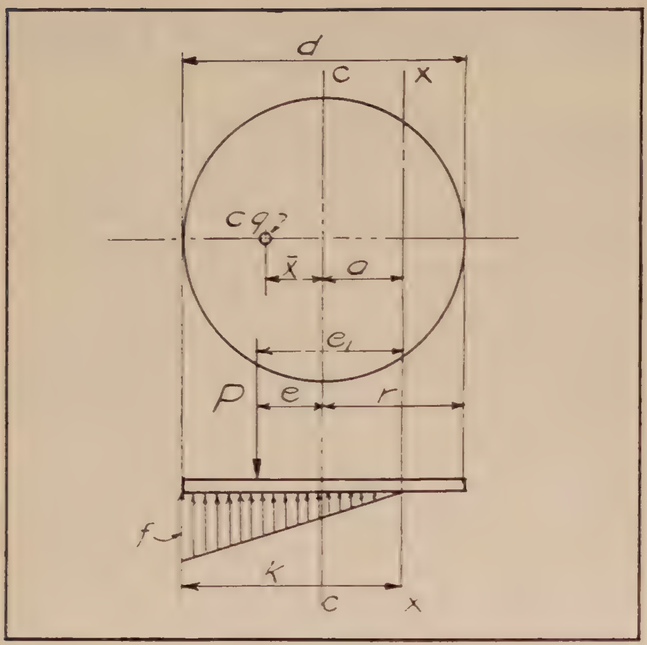
[1] Associate Professor of Civil Engineering, Armour Institute of Technology, Chicago.

[2] Assistant Professor of Structural Engineering, Armour Institute of Technology.



Equating the moments of the load and pressures about X–X—

$$P\,e_1 = \int \frac{f}{k} x^2\,dA = \frac{f}{k} I_{x-x} \qquad (2)$$

where I_{x-x} is moment of inertia of bearing area about X–X.

Combining equations (1) and (2)—

$$P = \frac{f}{k} M_{x-x} = \frac{f}{k}\,\frac{I_{x-x}}{e_1} \qquad e_1 = \frac{I_{x-x}}{M_{x-x}} \qquad (3)$$

From equation (1),

$$f = \frac{P\,k}{M_{x-x}} \qquad (4)$$

Equations (3) and (4) make it possible to find the eccentricity e_1 and the maximum stress f for any given segment provided that I_{x-x} and M_{x-x} for the segment are known. In order to find these terms the various properties of the circular segment may be found about the centroidal axis C–C of the full circle, and then transferred to the X–X axis.

Let A = the area of the segment, M_{c-c} = the static moment of this area about the C–C axis and I_{c-c} = the moment of inertia of this area about the C–C axis. Then by integration the following equations may be obtained:

$$A = \frac{\pi r^2}{2} \pm \left[a\sqrt{r^2 - a^2} + r^2 \sin^{-1}\frac{a}{r} \right]$$

$$M_{c-c} = \frac{2}{3}(r^2 - a^2)^{\frac{3}{2}}$$

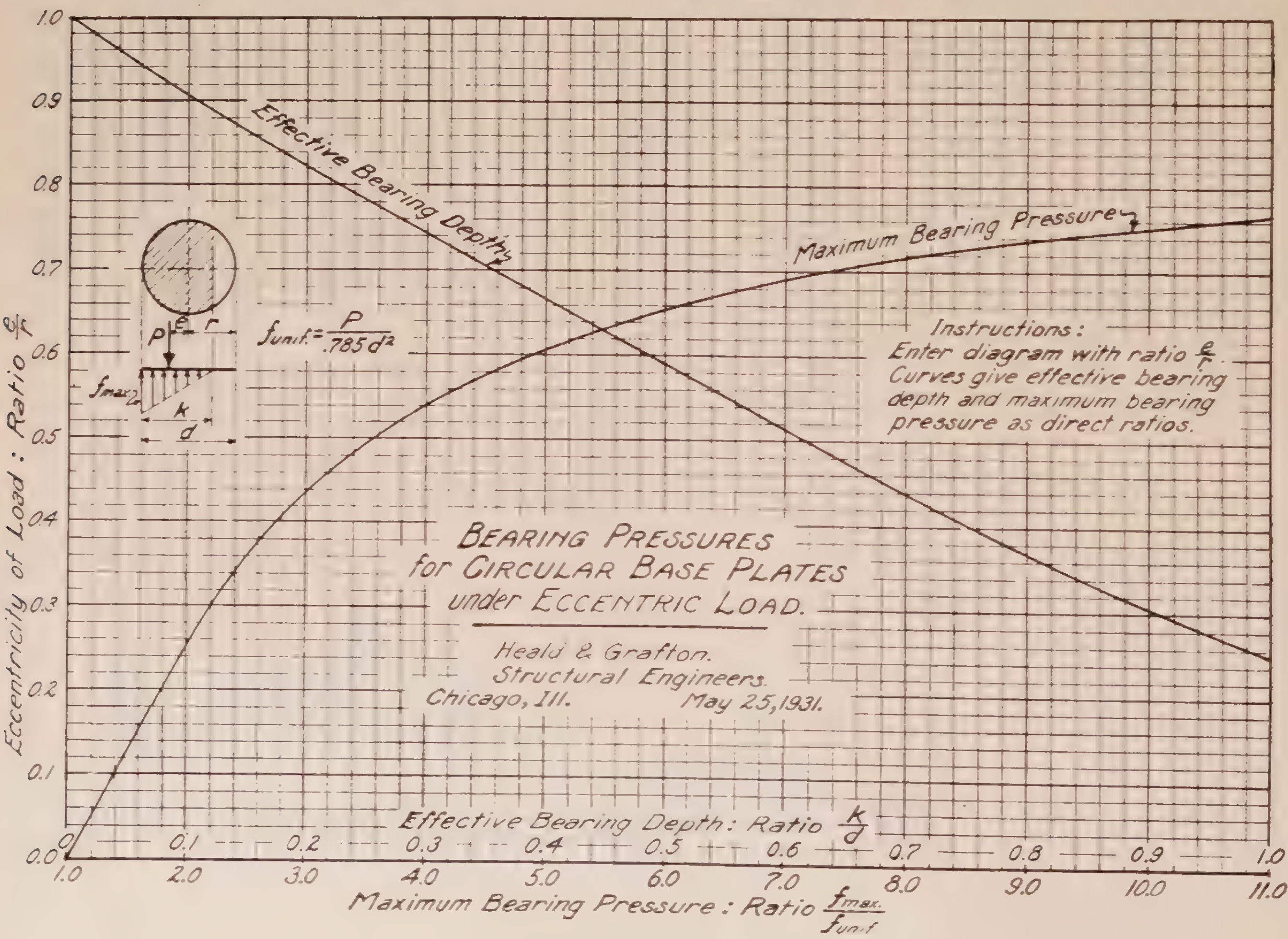
$$x = \frac{M_{c-c}}{A}$$

$$I_{c-c} = \frac{\pi r^4}{8} \pm$$

$$\left[\frac{r^2 a}{4}\sqrt{r^2 - a^2} + \frac{r^4}{4}\sin^{-1}\frac{a}{r} - \frac{a}{2}(r^2 - a^2)^{\frac{3}{2}} \right]$$

$$M_{x-x} = A\,(x \pm a) = M_{c-c} \pm A\,.\,a$$

$$I_{x-x} = I_{c-c} + A\,a^2 \pm 2\,A\,a\,x$$



Instructions:
Enter diagram with ratio $\frac{e}{r}$.
Curves give effective bearing depth and maximum bearing pressure as direct ratios.

BEARING PRESSURES
for CIRCULAR BASE PLATES
under ECCENTRIC LOAD.

Heald & Grafton.
Structural Engineers.
Chicago, Ill. May 25, 1931.

In the above equations where the signs are shown as plus or minus use plus when k is greater than r and minus when k is less than r.

Procedure

Using the formulas developed above, the properties of circular segments about the $C–C$ axis and about the $X–X$ axis were computed, with values of k varying from 0 to 1.00, for a circle of unit diameter. For convenience Table 1 and Table 2 were prepared.

Since the calculations are made for a circle of unit diameter, the value of f, the maximum stress under the base, can be expressed by comparison with the uniform pressure that exists for a concentric load. This ratio is shown in Table 2.

The accompanying diagram was prepared from the tabulations in Table 2 to give the ratio of maximum to average stress for all ratios of eccentricity to radius.

A. S. T. M. Issues Specifications for Concrete Masonry Units

Higher Strength Required for Thin-Shelled Units—Tentative Standard Issued in Leaflet Form—Permissible Absorption

MANUFACTURERS and users of hollow load-bearing concrete masonry wall units will be interested in the physical requirements for these units, as established by the American Society for Testing Materials in its new tentative standard entitled "Tentative Specifications and Tests for Load-Bearing Concrete Masonry Units" (Serial Designation: C 90-31 T). The paragraphs that follow, numbered from 1 to 9, comprise that part of the standard that covers the specifications. The remaining part of the leaflet sets forth the standard methods of testing.

1. These specifications apply to strength, absorption and general requirements of hollow load-bearing concrete masonry wall units made from portland cement and suitable aggregates such as sand, gravel, crushed stone, bituminous or anthracite cinders, burned clay or shale, and blast-furnace slag.

Compressive Strength

2. The average compressive strength of five units at the time of delivery to the site shall be not less than the following:

Minimum Face Shell Thickness, In.	Compressive Strength Based on Gross Area, Lb. Per Sq. In. Mean of Five Tests	Individual Minimum
1¼ or over	700	600
Under 1¼ and over ¾	1,000	800

Absorption

3. (*a*) Concrete masonry units which will be exposed to the weather or soil in the finished work (without brick, stucco or other suitable protective covering approved by the purchaser) shall not absorb more than 15 lb. of water per cu. ft. of concrete actually contained.

(*b*) Units which will be suitably protected from the weather or soil in the finished work need not conform to the absorption requirement specified in Paragraph (*a*).

Dimensions and Permissible Variations

4. No dimension shall vary more than 3 per cent over or under the specified dimension for any form or size of unit.

Workmanship and Finish

5. (*a*) All units shall be sound and free from cracks or other defects as would interfere with the proper placing of the unit or impair the strength or permanence of the construction.

(*b*) Units which are intended to serve as a base for plaster or stucco shall have a sufficiently rough surface to give good bond.

Marking

6. All units shall bear a distinctive mark of the manufacturer or shall otherwise be readily identified as to origin.

Inspection and Rejection

7. Proper facilities shall be provided the purchaser for sampling and inspection either at the factory or at the site of the work, as may be specified in the contract. The inspection shall be based on the requirements specified above. At least ten days from the time of sampling shall be allowed for the completion of tests. All tests shall be made in accordance with the methods specified in Sections 10 to 25[1].

8. Individual units shall be rejected for failure to meet size or workmanship and finish requirements. In case of failure to meet the strength and/or absorption requirements, the manufacturer may sort the shipment and new samples shall be selected by the purchaser from the retained lot and tested at the expense of the manufacturer. In case the second set of samples fails to meet the test requirements the entire set shall be rejected.

9. Except as specified in Section 8 and unless otherwise agreed, the expense of inspection and testing shall be borne by the purchaser.

[[1] These sections comprise the part of the standard that deals with methods of testing, not printed here.]

Portable Conveyors Place Concrete on Illinois Terminal Project

Concrete Placed Economically on St. Louis Terminal Warehouse and Depot—Flexibility of Belt Conveyors—Crew Quickly Adapted to Use of Units

By G. L. TARLTON
General Contractor, St. Louis, Mo.

ON the Illinois Terminal project, now under construction at St. Louis, Mo., the practical advantages of portable conveyors for conveying and placing concrete are shown. This project consists of a terminal warehouse and depot, located at 12th and Washington streets, St. Louis. A subway runs under High Street, the street being the newly constructed roof of the subway. Under this roof will be the tracks serving the Globe-Democrat Building and the Star Building, both newspaper office buildings.

Street Deck 2,200 Ft. Long

This roof, or street, is 100 ft. wide and 2,200 ft. long, constructed of reinforced concrete, consisting mainly of a 10-in. slab, running about 5½ cu. yd. of concrete per lin. ft. (100 ft. wide), with 700 lb. of reinforcing steel per lin. ft. The total volume of concrete in the roof is about 12,000 cu. yd., this being placed in 20-ft. sections.

Portable Conveyors Distribute Concrete

Portable conveyors were selected for the receipt and distribution of ready-mixed concrete in preference to building a ramp, or any other method, because they involved the least preparation expense, they were reliable, and they enabled the concreting of the street deck to progress naturally and with minimum effort. The ease with which they can be shifted permitted flexibility in the construction operations.

The concrete was a 1:2:4 mixture, 4 to 5-in. slump, delivered from a central mixing plant in "bathtub" body trucks, containing 2.1 cu. yd. each. The concreting schedule called for a load every three minutes. The belt speed of the conveyors was slowed down to suit the loading. To accommodate the distributing and tamping, about 1½ to 2 minutes was taken to discharge concrete on the first conveyor.

The plan of concreting was to advance in 20-ft. sections. A total of 8 portable belt conveyors were used at times, which gave a conveying line of slightly more than 200 ft. The conveyors used are 26 ft. long and have belts 24 in. wide. They are standard equipment, except that a V-shape rubber scraper was applied to the return run, this rubber wiper keeping the belt clean. The belt feed was 150 ft. per minute and the conveyors handled 1 to 1¼ cu. yd. of concrete per minute, at angles up to 20 deg. at the final conveyor. Final placing of the concrete was accomplished by a short swinging chute, as shown in Figure 2.

Team Work in Labor Crew

Labor involved in distributing the concrete consisted of 11 laborers, 2 hoisting enginemen, and 1 oiler. After a few days of experience, the amount of team work displayed by the crew was little short of remarkable. There was a practical absence of any "hitches" in the natural, easy flow of the concrete from the truck, over the successive conveyors to the final placing. A few hours of operation of the conveyors cleared up certain hazy prejudices against the system of conveying concrete by portable loaders.

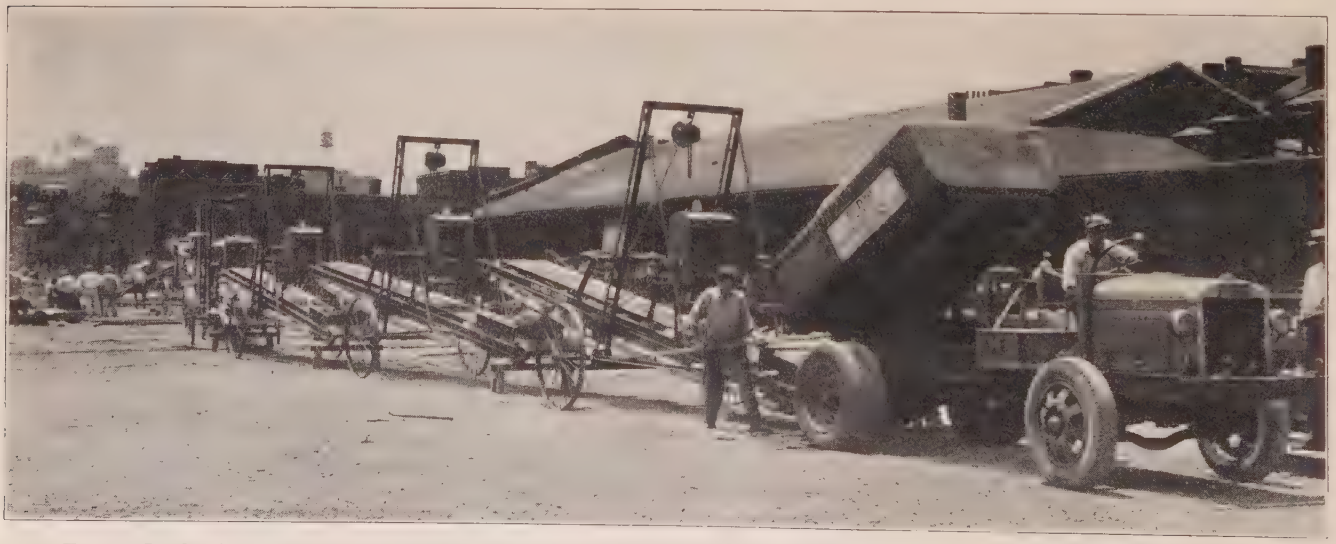


Figure 1. Eight portable belt conveyors distribute ready-mixed concrete from truck to final point of deposit

To accommodate the 100-ft. width of the street deck, the conveyor line was moved about 5 times for each 20-ft. section of floor length. This shifting required a slight delay, depending on the number of conveyors in use at the time. Here the team work, already mentioned, was emphasized, and less than a minute was taken to move and line up a conveyor. To aid the resetting and lining up, each conveyor was provided with a wide hopper on the foot end, to place the concrete properly on the belt. A complete 20-ft. section, 100 ft. wide, was concreted in about 4½ hours. As each of the conveyors was powered by its own 8-hp. gasoline engine, complete flexibility was maintained at all times.

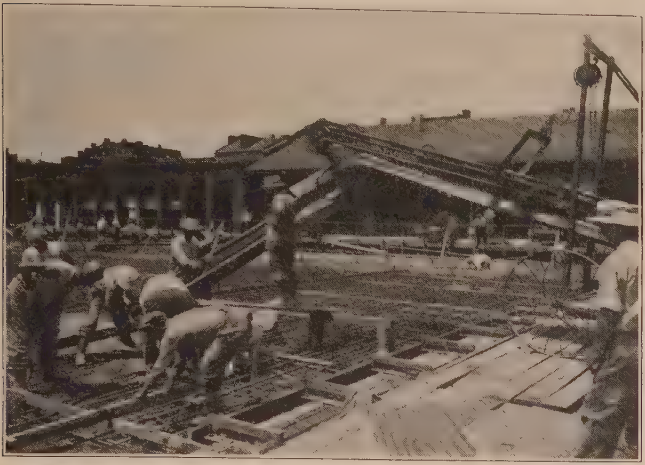


Figure 2. The last conveyor delivers concrete into swinging chute for final distribution

Acknowledgments

The contract for this work was held by the writer, and the work was done under the direction of J. C. Hail, general manager, and Frank Munro, general superintendent, representing the St. Louis Electric Terminal Railway Co. Merker & Co., of St. Louis, acted as supervising engineers. The portable belt conveyors were manufactured by the Link-Belt Co. of Chicago.

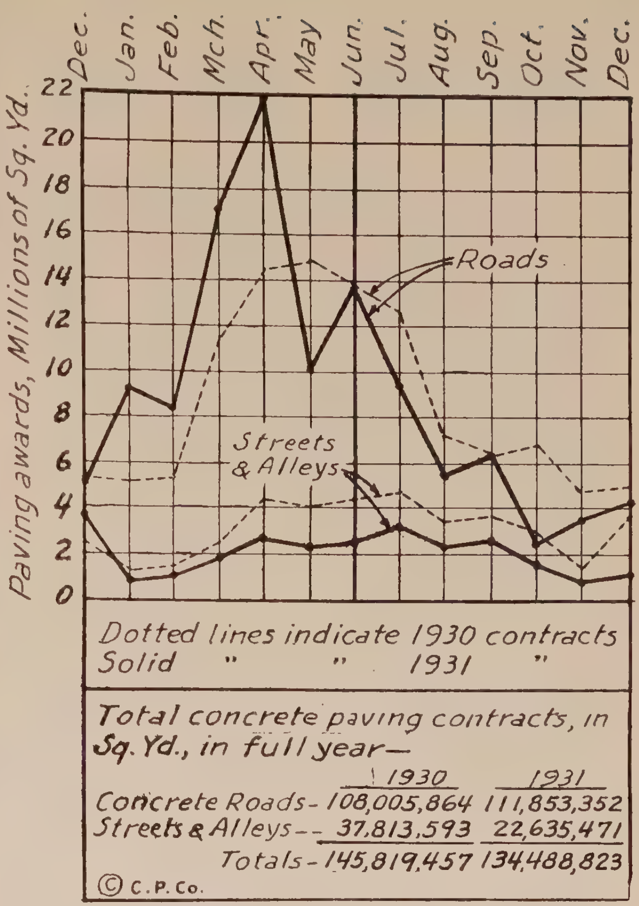
Concrete Road Contracts Lead 1930 by Four Million Yards

Lag in Concrete Street and Alley Paving Pulls Total Below Previous Year

Contracts for concrete road construction awarded in December amounted to 4,215,154 sq. yd., bringing the total for the year to 11,853,352, or nearly 4 million above the previous record of 108,005,864 sq. yd. awarded in 1930.

Awards for concrete street and alley pavements amounted to 1,148,987 sq. yd. in December, bringing the year's total to 22,635,471 sq. yd., about 15 million short of the yardage in that class of paving in 1930. The net result is that the 1931 total of 134,488,823 sq. yd. is about 11 million square yards below the 1930 total of 145,819,457.

The figures just given for the full year of 1931 represent a new record over all previous years, so far as concrete road contracts are concerned; but the large drop in concrete street and alley paving brought the grand total below the figures for 1930 and 1929.



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Ohio Contractors Organize to Back Concrete Pavement

The Ohio Concrete Paving Association was formed at a meeting held at Columbus, Ohio, in December.

Composed of nearly one hundred road contractors, its purpose is to promote the use of concrete in all future state highway paving projects.

Correction

The Figure 1 referred to in the annual highway review, "Concrete Road Construction Makes New Record in 1931," beginning on Page 7 of the January issue, was improperly designated as "Figure 2. Sectional dimensions of single-lane concrete roads in Champaign County, Ill."

The description correctly would have read "Figure 1. Resurfacing and widening section being tried out in Virginia."

The second drawing should have been designated as "Figure 2. Sectional dimensions of single-lane concrete roads in Champaign County, Ill."

HOW TO DO IT

✦ **Questions and Answers** ✦
Consultation and Comment

A department devoted to the solution of problems encountered in concrete work. Readers are welcome to add to or improve upon the suggestions printed and to submit their views for possible publication.

Adhesion of Stucco to Concrete Masonry Building Units

Can stucco be depended upon to adhere properly to smooth-faced hollow concrete block, or will it be advisable to score the block in some way during the manufacturing process?—R. C. A., Lubbock, Tex.

The adhesion of stucco to concrete masonry wall units is aided if a rough surface texture can be produced during manufacture of the units. This is best accomplished by using coarse aggregate of a rough or porous texture, such as crushed stone, crushed blast furnace slag, steam boiler cinders, or special aggregates such as haydite or pottsco.

When a rough surface can be provided in this manner, it is often possible to apply the stucco in a single coat with a trowel. If the surface of the units is smooth, as in your case, a dash coat should first be placed to establish bond. After the dash coat has been cured and hardened for about two days, the finish coat is added with a trowel.

In all cases the surface to be coated should be moistened (but not made excessively wet) just before the stucco is applied, in order to obtain uniform suction.

Regardless of the character of the surface of the wall units, the masons should be instructed *not* to point the joints when laying up the masonry. These open joints provide an excellent additional key for the adhesion of the stucco.

It is assumed, of course, that you have reference to portland cement stucco, to which the foregoing practice applies. No attempt should be made to apply magnesite stucco in the manner described.

Foundations for Dwelling Houses Having Concrete Floors

When building a concrete first floor in a residence is it necessary to have a heavier foundation to carry the weight of the floor than when a wood joist floor is used?—W. E. S., St. Louis, Mo.

In general, heavier foundations or footings are not required with reinforced concrete floors in residences. Either concrete masonry or monolithic concrete foundation walls, as ordinarily built, will support concrete residence floors. Where the floor is supported on a concrete masonry wall, it is customary to fill the core spaces in the top course with concrete to provide a substantial support for the slab and to distribute the weight uniformly to the wall. Concrete floors should have a minimum bearing of 5 in. on the wall.

Explanation of Mortar Void Theory of Proportioning

In your issue of May (1931), *in an article entitled "Controlling Quality of Concrete for State Highway Work," a statement appears to the effect that in many states the proportioning of the concrete mixture is based on the so-called mortar void theory.*

Will you kindly give me some further information on this method of proportioning?—A. C. E., Melbourne, Australia.

A good explanation of the mortar void theory and its practical application to concrete highway work will be found in an article by E. R. Kendall, assistant director of the state highway laboratory at Ann Arbor, Michigan, printed in the October (1929) issue of CONCRETE, pages 41-44.

This theory was developed by Talbot and Richart, at the University of Illinois. It is described in Bulletin No. 137, of the Engineering Experiment Station, University of Illinois, Urbana, Illinois, from where copies may be obtained at 60 cents each. The title of Bulletin No. 137 is "The Strength of Concrete: Its Relation to the Cement, Aggregates and Water."

Industrial Liquids Injurious to Concrete; Protective Coatings

In designing reinforced concrete storage tanks and underground reservoirs we are frequently confronted with the question as to what character of industrial liquids and oils are likely to attack concrete, and what groups are harmless. Can you refer me to an authoritative classification of such liquids, in which the injurious substances are separated from the harmless? S. G. W., Louisville, Ky.

W. S. Gray, in his recent volume on "Reinforced Concrete Reservoirs and Tanks," (Concrete Publications Limited, 20 Dartmouth St., London) names the following as substances that are harmless to concrete:

(1) Bases and compounds of carbon (the paraffins).
(2) Calcium chloride, sodium chloride, oxalic acid (the only harmless acid), sodium hydrate, sal ammoniac, and lime water.
(3) Mineral oils (those not containing sulphur that is liable to form hydrogen sulphide), benzol, paraffin, vaseline, and related oils.

Substances which are likely to be injurious to concrete include:

(1) Nearly all acids, including sulphuric, hydrochloric, nitric, hydrofluoric, carbonic, oleic, saccharic, and acetic acids, and phenol.
(2) Many salts, including magnesium sulphate (in sea water), magnesium chloride, sodium sulphate, linseed oil, olive oil, butter, cocoa butter, and all other fat oils. Of this group the sulphates are probably the most injurious.

Protective coatings include linings of glass plates jointed with acid-resisting cement, coatings of acid-resisting asphalt, coatings of paraffin wax, and mixtures of pitch and tar.

ORGANIZATIONS

American Association of State Highway Officials; W. C. Markham, Executive Secretary, 1222-24 National Press Building, Washington, D. C.

American Concrete Institute; Harvey Whipple, Secretary, 641 New Center Building, Detroit, Mich.
Twenty-eighth annual convention, March 1-4, Wardman Park Hotel, Washington, D. C.

American Concrete Pipe Association; M. W. Loving, Secretary, 33 West Grand Ave., Chicago.
Twenty-fifth annual meeting, February 1-2, Edgewater Beach Hotel, Chicago, Ill.

American Road Builders' Association; Chas. Upham, Engineer-Director, National Press Building, Washington, D. C.

American Society of Civil Engineers; Geo. T. Seabury, Secretary, 33 West Thirty-ninth St., New York City.

American Society for Testing Materials; C. L. Warwick, Secretary-Treasurer, 1315 Spruce St., Philadelphia, Pa.

Associated General Contractors of America; E. J. Harding, Managing Director, 222 Munsey Bldg., Washington, D. C.

Building Officials Conference of America; Col. John W. Oehmann, Secretary, 1253 Lawrence St., N. E., Washington, D. C.

Cast Stone Institute; L. A. Falco, Secretary, Chapel St. and Blatchley Ave., New Haven, Conn.

Cement Institute; Luther G. McConnell, General Manager, 11 East 44th St., New York City.

Concrete Masonry Association; Jack Franklin, Secretary, 7071 Plankinton Bldg., Milwaukee, Wis.
Annual meeting, March 1-2, Wardman Park Hotel, Washington, D. C.

Concrete Reinforcing Steel Institute; M. A. Beeman, Secretary, Tribune Tower, Chicago.

Engineering Institute of Canada; 2050 Mansfield St., Montreal, Quebec.

Joint Committee on Standard Specifications for Concrete and Reinforced Concrete; F. R. McMillan, Secretary, 33 West Grand Ave., Chicago.

National Board of Fire Underwriters; W. E. Mallalieu, General Manager, 85 John St., New York City.

National Concrete Burial Vault Association; J. H. Stuart, Secretary-Treasurer, Bremen, Ohio.

National Crushed Stone Association; J. R. Boyd, Secretary, 1735 14th Street, N. W., Washington, D. C.

National Engineering Inspection Association; B. H. Witherspoon, Secretary, P. O. Box 1115, Pittsburgh, Pa.

National Fire Protection Association; Franklin H. Wentworth, Secretary, 40 Central St., Boston, Mass.

National Lime Association; Norman G. Hough, Secretary and Manager, 927 Fifteenth St., N. W., Washington, D. C.

National Ready-Mixed Concrete Association; V. P. Ahearn, Secretary, 545 Munsey Building, Washington, D. C.

National Sand and Gravel Association; V. P. Ahearn, Executive Secretary, 545 Munsey Bldg., Washington, D. C.

National Slag Association; H. J. Love, Secretary-Treasurer, 937 Leader Bldg., Cleveland, Ohio.

National Terrazzo and Mosaic Association; U. F. Durner, Secretary, 815 West St. Paul Ave., Milwaukee, Wis.

Northwest Concrete Products Association; W. P. Hews, Secretary-Treasurer, Yakima, Wash.

Portland Cement Association; Edward J. Mehren, President; William M. Kinney, General Manager, 33 West Grand Ave., Chicago.

Rail Steel Bar Association; H. P. Bigler, Engineering Secretary; Builders' Bldg., 228 N. La Salle St., Chicago, Ill.

Wire Reinforcement Institute; R. D. Bradbury, Director, National Press Bldg., Washington, D. C.

Wisconsin Concrete Products Association; Jack Franklin, Secretary-Treasurer, 425 East Water St., Milwaukee, Wis.

New Books and Pamphlets

A. S. T. M. Proceedings Available

The 1931 Proceedings of the American Society for Testing Materials, published in two volumes, or parts, are now available for distribution.

Part I contains the annual reports of the A. S. T. M. committees and the papers and standards appended to those reports. Part II contains the technical papers which were presented at the annual meeting of the society in June, 1931. Each part contains more than 2,100 pages.

Copies of the Proceedings may be obtained from the secretary of the A. S. T. M., 1315 Spruce St., Philadelphia, at $6 for each part if in cloth binding, or $7 each if in half leather.

Concrete Engineers' Manual

Concrete Engineers' Manual. By Samuel Baker and A. DeGroot. Published by International Textbook Company, Scranton, Pa. Cloth, 401 pages, 5 by 7½ in.; numerous drawings, charts and tables.

This volume is intended as a textbook for students of concrete engineering, and as a reference book for designers, foremen, inspectors, and others involved in the design of concrete structures and in the making and placing of concrete.

The book contains a complete description of the modern methods of proportioning concrete mixtures, mixing and placing concrete and steel, and providing waterproofing. Mathematical tables and the fundamental principles of mathematics and mechanics of materials, as applied to reinforced concrete designs, are included.

Among other subjects treated in individual chapters are form work, foundations, design of retaining walls, and estimating concrete work.

Decoration and Protection of Concrete

The Protection and Decoration of Concrete. By Maximilian Toch, D.Sc. Published by D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York. Cloth, 54 pages, 5 by 7¼ in.; 16 halftone illustrations. Price $2.00.

This book is intended as a treatise covering the subject of painting and decorating concrete in a scientific manner. In order to avoid long drawn out discussions and tabulations of tensile and compressive strengths, the author has classified certain pigments as either increasing or decreasing tensile and compressive strengths, or as having little or no effect.

The numerous harmful and beneficial colors which can be added to portland cement have been classified in accordance with their composition, so that even the non-technical purchaser can select material which he knows will not injure the resulting structure.

Molds for Cast Stone and Concrete

Molds for Cast Stone and Concrete. By F. Burren and G. R. Gregory. Published by Concrete Publications, Ltd., 20 Dartmouth St., Westminster, London, S.W. 1, England. Heavy board cover, 79 pages, 11 by 7½ in.; 44 full page illustrations.

The purpose of this book is that of presenting the practical mold maker with detailed working drawings covering a wide range of concrete and cast stone products. While the drawings are largely relied upon to supply the necessary information, brief descriptions are given in each case.

New Light-Weight Clay Aggregate On Western Market

Start Commercial Production After Experimenting Two Years—The Manufacturing Process—To Establish Other Plants

After two years of intensive research and development work, W. F. MacGlashan Associates, of Alhambra, Calif., have completed the installation of a plant to manufacture Cel Sealed Aggregate with a capacity ranging from 100 to 140 cu. yd. per day, depending upon the weight of the aggregate.

A handful of Cel Sealed Aggregate, a light-weight material

Little information has been published about the product. The process consists of pugging ordinary clay or top soil, forcing it through dies and cutting it into lengths approximately equal to the diameter. These pellets are then coated with a refractory material, rounded by ball-rolling machines, or the refractory surface may be obtained by heat treatment. The pellets are then charged to a rotary kiln fired by either fuel oil, gas, or powdered coal. The refractory coating or heat treatment forms an impervious layer on the surface of each pellet.

It is reported that the process has been perfected so that there is a complete control of size, weight and strength of the aggregate. The rounded form of the pellets, with a tough impervious surface and cellular interior, results in great strength with light weight. The sizes thus far produced range from less than ⅛ in. to more than 2 in. in diameter, and the weight ranges from 14 to 35 lb. per cu. ft. and over.

Extensive tests show that an exceedingly strong concrete of light weight can be obtained with Cel Sealed Aggregate, possessed of unusual workability. Surprisingly low water-cement ratios become practical, resulting in monolithic concrete of great strength and uniformity. It is reported that three Los Angeles laboratories have been working independently in conducting tests of this material, and their results indicate concrete weighing 90 lb. or less per cu. ft., with a compressive strength of 2,500 lb. per sq. in. in 28 days.

Lighter weight concrete can be made, depending upon the strength requirements. Concrete in which strength is not a factor can be made so that it will float in water. The nature of the product is such that it lends itself admirably to optimum grading.

Judging from the evidence available at present, Cel Sealed Aggregate should be well received by the construction industry, based on the indicated prices to the trade. It is said that negotiations are now in progress with prospective associates for the establishment of Cel Sealed Aggregate plants at strategic points in the East and Middle West.

New Equipment and Materials

Super Surfacer and Finisher All-Purpose Tool

For general, all purpose use—for the small contractor and for the large one on isolated jobs—the Super Concrete surfacer and finisher is recommended by the Jas. Clark, Jr., Electric Co., Louisville, Ky.

The unit weighs 18 lb., is supplied with an automatic switch and is complete in itself, the manufacturer states.

Machine and accessories are supplied compactly packed in a tool kit designed for field work. Parts furnished include sanding head complete with arbor, for either wooden or steel forms, six spare discs for polishing, two surfacing stones unset in the flange, spare stone and flange, wire end brush for removing rust from steel and cleaning masonry, capacity chuck and key, and grinding wheel and arbor for sharpening.

3-H.P. Grinder is a New Product of Mall Company

A 3-h.p. bump grinder serving also as drill, saw and general maintenance tool is the newest addition to the line of flexible shaft equipment of the Mall Tool Co., Chicago.

The grinder develops over 5 h.p. maximum and is said to operate at a sufficiently high speed so that when grinding a very coarse cup wheel may be used without chipping pebbles and aggregate.

Included in its construction is an adjustable spring type mounting for the angle spindle which allows the cup grinding wheels to follow the nature of the surface irregularity, so that all high spots are ground down to a common level.

Attachments include a 7-ft. flexible shaft and short shaft for concrete road or floor use. The shafts may be quickly interchanged and the spindle placed on the end of the long shaft for surfacing bridges, culverts and other wall work.

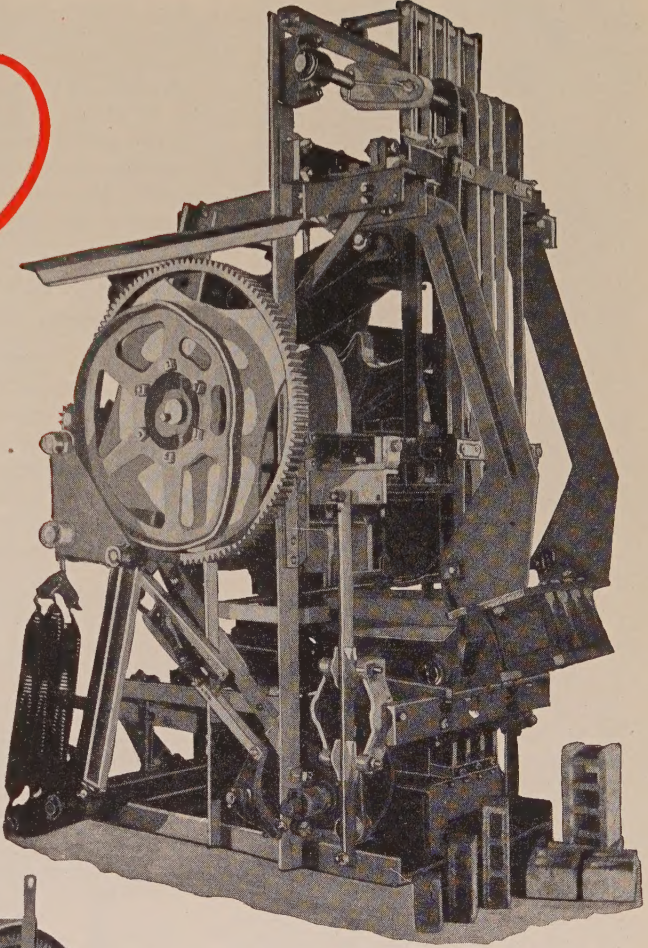
Berg Heavy-Duty Surfacer

The Berg heavy duty concrete surfacer, built for rugged service on side walls and ceilings, is shown in the illustration.

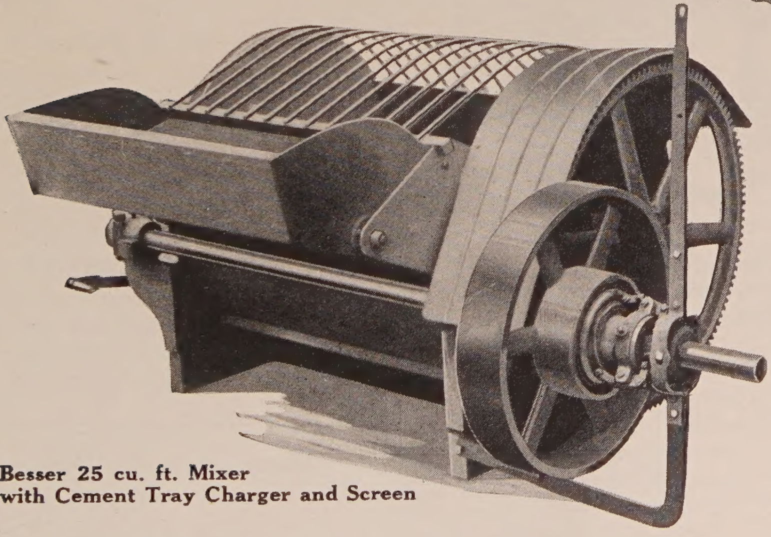
This equipment is made in two models—

For Lower Production Cost

Besser Strippers hold unsurpassed records for low production cost. They are entirely automatic in operation, simple and sturdy in construction and capable of making every type and size unit, from any concrete masonry aggregate, on one size plain pallets. Besser Strippers are made in three capacity sizes to meet different production requirements.



Besser Standard Stripper



Besser 25 cu. ft. Mixer with Cement Tray Charger and Screen

Besser Batch Mixers are strong and durable in every detail. They are speedy and thorough in action and easy to operate. These proven qualities have won for Besser Mixers their reputation for low production cost.

Ask for Illustrated Catalogs of Besser Strippers and Besser Batch Mixers

BESSER MANUFACTURING COMPANY
COMPLETE EQUIPMENT FOR CONCRETE PRODUCTS PLANTS
Main Office and Factory, 202 32nd Street, Alpena, Michigan

District Sales Offices at
Detroit - Pittsburgh - Philadelphia - Newark - Dayton - Chicago - Milwaukee - Omaha - Indianapolis

better own a BESSER than compete with one

This advertisement is to help you get ready for better business

electric and gas engine. The former type is equipped with a 110-220-volt, single-phase, alternating-current motor, according to the Concrete Surfacing Machinery Co., Cincinnati, Ohio.

Egg-Shaped Pipe Designed to Be Self-Cleaning

The self-cleaning feature of the new Mueller egg-shaped concrete sewer and water pipe is one of its outstanding features, according to the Mueller Concrete Construction Co., Detroit, Mich.

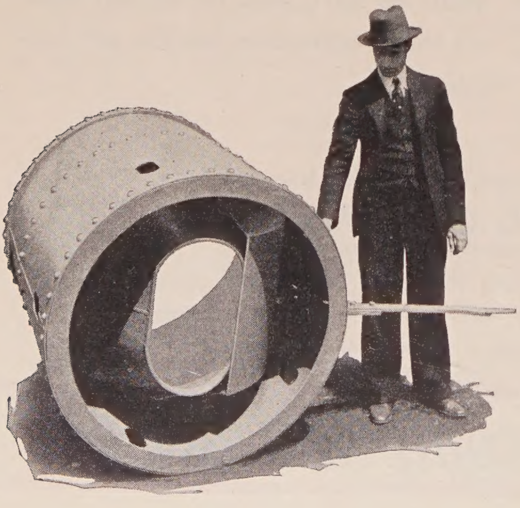
Less excavation and backfill reduces installation cost and there is practically no maintenance cost on account of the superior strength and self-cleaning properties even with dry weather flow, the manufacturers state.

Blaw-Knox Buys Rights to Wiley Concrete Bucket

A new product of the Blaw-Knox Co., Pittsburgh, Pa., is the concrete bucket formerly known as the Wiley, the exclusive manufacturing and sales rights of which have been bought from the Dayton Whirley Co., Dayton, Ohio. The product is now known as the Blaw-Knox concrete bucket. Descriptive literature is available upon request.

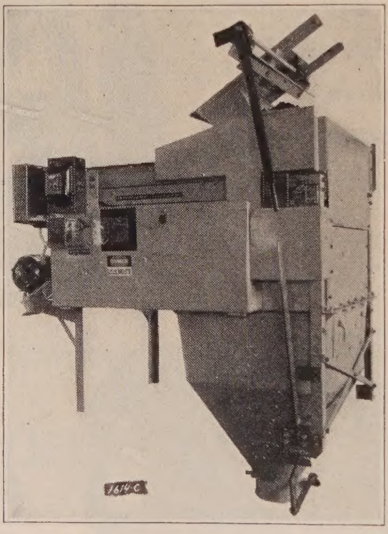
These buckets are for derrick or cableway operation, but can also be used as floor hoppers for loading buggies, wheelbarrows, or discharging into chutes. The buckets utilize a single radial gate for opening and closing. They are available in 18, 33 and 63 cu. ft. capacities.

The gate is said to be easy to operate regardless of the amount of concrete in the bucket, giving absolute control of the discharge of the aggregate at all times.



Duo-Screw Automatic Cement Scale at Road Show

The automatic cement weigher — the Model M-39 Richardson Duo-Screw feed automatic cement scale—approved by the Bureau of Standards, New York State, and the Canadian Government, is reported to have attracted much interest at the 1932 road show in January.



The feeding screws were under power and the operation of the complete machine was demonstrated approximately as in the field.

Forty of these units are said to have been used in 1931 highway building in New York alone, where they met all recommendations and requirements of the highway commission.

The Model M-39 scale has a capacity of from 400 to 1,000 lb. of cement weighing 77 lb. or more per cu. ft. It is equipped with both a full capacity beam and a subsidiary beam graduated together from 0 to 1,000 lb., and has a guaranteed speed of two weighings per minute. Construction is said to be such as to obviate tampering or manipulation.

The automatic feeding and control system consists of two enclosed, inclined parallel screw conveyors of ample size and special pitch designed to convey the cement without flushing from bin to scale hopper, according to the Richardson Scale Co., Clifton, N. J.

Industrial Literature

Tricosal Products

Tricosal Products is a loose-leaf booklet descriptive of the admixture of that name produced by the *Midwest Tricosal & Material Co.,* Chicago.

Tricosal is described as a neutral liquid, organic in origin, of a high colloidal nature, composed of certain quantities of lysalbinic and protalbinic acids.

Haydite Manufacturers Booklet

The Haydite Manufacturers' Association, Kansas City, Mo., has issued a 16-page booklet entitled *"Haydite Walls for Better Homes."*

It is addressed to home owners and presents the properties of the aggregate and describes and illustrates Haydite building units and their construction.

Portland Cement Siding

Erection Data for Careystone corrugated asbestos roofing and siding are given in a 30-page leaflet, prepared by the *Philip Carey Co.,* Lockland, Cincinnati, Ohio.

This product comprises 85 per cent portland cement and 15 per cent asbestos fiber and is said to be fire-, rot- and rustproof.

Jaeger Road Pumps

Jaeger road pumps are described in a broadside recently prepared and distributed at the road show by the *Jaeger Machine Co.,* Columbus, Ohio.

Cross section, cut-away and full views are shown.

Curing with Sisalkraft

Concrete Curing—What it is and how to get it at low cost is told in a 4-page folder on Sisalkraft distributed at the recent road show by the *Sisalkraft Co.,* Chicago, Ill.

Manufacturers' News

New Products Equipment Firm

The Kent Concrete Machinery Co. has been organized by *F. R. Brautigan* and *H. F. Holtje,* concrete products engineers, at New York City. The firm is the eastern representative for the Kent Machine Co., Cuyahoga Falls, Ohio, and the Blystone Manufacturing Co., Cambridge Springs, Pa.

The new company specializes in the supply of all types of concrete products equipment as well as engineering service and advice on plant layout.

HERE COMES THE CONCRETE— THERE GOES THE DIRT

LOOK in the upper left corner and see where this string of 18 Barber-Greene belt conveyors starts, at the central mixing plant.

Look in the lower corner and see where the concrete is discharged into the caisson form.

Look at the conveyor tapping the line 7 units back, and the one running off the picture to the left. The first poured a caisson just before this picture was taken; the second just after.

Look at the long B-G permanent conveyors removing excavated material.

Look at the absence of men - the absence of confusion on this job. This is the new Chicago Post Office.

On a similar job 8 Barber-Greenes saved $108.00 a day.

Look into these Barber-Greene conveyors. A line from you will bring our booklet "CONCRETE HANDLING". No obligation.

Standardized Material Handling Machines

BARBER GREENE

LOADERS
DITCHERS
CONVEYORS
COAL HANDLERS

711 W. Park Ave., Aurora, Illinois

Back to Machinery Prices of 12 Years Ago

Miles
CONCRETE
EQUIPMENT

FOR 34 years this company has been engaged exclusively in the manufacture of concrete products plant equipment.

For 34 years our engineers have been exploring the frontiers of scientific development in the manufacture of concrete products. As soon as new and better methods of manufacture have been devised, these innovations have been added to Miles machines.

The history of Miles equipment has been a history of constant improvement. Every year of the 34 has seen some addition to strength, some speeding up of operation, some improvement that has enabled Miles users to increase the quality of their product or to reduce its manufacturing cost, or both.

In this long period of development we have had the cooperation of leading concrete products plants.

Today the products manufacturer has many different makes of equipment to choose from. The Miles is not the only good line. But *no line of equipment represents a greater value per dollar of investment.*

The year ahead presents special problems to every products manufacturer. These problems will be met most easily by the manufacturer who watches his capital investment—who makes sure that his legitimate gross profits are not all eaten up by Overhead.

Values have shrunk in the last 24 months. Raw materials have become cheaper. Labor is available at lower wages. You must be content with lower prices for *your* product.

That means that you must cut your own production costs. With your raw material prices cut, with labor deflated, it remains for you to deflate your equipment purchases. Buy good machinery, simple machinery, swift-operating machinery that will produce superior products at minimum cost.

Miles offers you such machinery at the price it sold at twelve years ago. Yet current models have at least 50% greater efficiency than the corresponding models had in 1919!

Face-down block machines (hand or power operated), stripper block machines (hand or power operated), power tampers, elevators, feeders—every machine honestly built to give a maximum of honest service. Every model sold at a price in line with today's economic situation.

If you want to make money in the products business this year, you must equip your plant for economical operation. You must at the same time keep equipment investment down. Let us tell you how we can help you follow both those rules.

Miles Manufacturing Company, Dept. A-232, Jackson, Michigan

34 Years

This advertisement is to help you get ready for better business